ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1924-25

In preparing a report on the activities of the Agricultural Department during the year 1924-25, I do so in a more hopeful spirit than on any previous occasion. The year was, on the whole, a good one,—and, further, the purpose for which the Department exists, namely so to work as to bring about an increase in the value of the produce of the land in the Bombay Presidency, seems to have made considerable progress and to afford promise of greater progress in the near future. There are gaps in that promise, and areas where little progress has been made,—but generally speaking we can look round the Presidency and see, in most areas, improvements worked out or introduced by the Agricultural Department in large scale use, a gradually increasing desire among the cultivators for fresh developments, and a very strong movement towards the organisation of local agricultural development by the people themselves in many areas.

SOME IMPROVEMENTS ALREADY INTRODUCED ON A LARGE SCALE.

Before indicating the main features of *this* year's work, I will just indicate the present position with regard to some of these matters. The improvement of crops largely by the supply of pure or more valuable seed, has been perhaps the biggest cause of the increase in the value of agricultural production. In the first place we have those cases where we have been able simply to test introductions from the outside, and when found useful, to spread them.

Groundnut.—The most striking cases of this are the gradual development of groundnut as a cultivator's crop in Khandesh and in Upper Gujarat by the use of quick-growing varieties of high oil content by the Agricultural Department. These have led to an enormous extension of the cultivation, as is shown by the figures for the area in 1912-13 and in 1924-25.

Groundnut Area.

	Khandesh.	North Gujarat.
	Acres.	Acres.
1912–13	4,119	395
1924–25	1,40,190	39,151

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When it is considered that this enormous increase means *partly* that a crop worth Rs. 40 per acre is replaced by one worth Rs. 80 to Rs. 100 per acre, and *partly* that it means an equally valuable crop to grow in substitution for cotton, the full value of the change will be perceived. I may say that Khandesh groundnuts, from the stock imported by the Agricultural Department, have now established themselves on the Bombay market as the most valuable in India, and importation of new stock to assist in maintaining the standard has recently been made.

Wheat.—Another introduction of very great value is the wheats from Pusa and the Punjab, which have been eminently successful both in Gujarat and as an irrigated crop, in Sind. In the last case "Pusa 12" wheat is spreading rapidly in Upper Sind where the area has increased from 5,000 acres to 14,000 acres in one year. This variety does not seem so useful for *bosi* land, and we are in active pursuit of another type which will fill the need. In South Sind "Punjab 11" wheat has spread in the Jamrao area, and will spread everywhere where the water supply allows wheat to be sown. In Gujarat, the type of wheat which has proved most successful has been "Pusa 4", and this has become exceedingly popular in the Panch Mahals and in Ahmedabad both on account of its increased yield (200 pounds per acre at Dohad) and the higher price it commands.

Cotton.—If we turn to cotton, perhaps bigger things have been achieved than in any other direction. In most cases, the varieties now supplied and maintained pure by Agricultural Department, have been evolved at our experimental stations. In Sind, however, introduced American cotton is now spreading fast on the Jamrao, in spite of a water supply which continually gets poorer for American cotton. I anticipate that the limit of American cotton in Sind will be about 25,000 acres, until the Sukkur barrage water becomes available, and the progress towards that point (using two varieties developed in the Punjab 'F4' and '285F') is shown in the following figures and diagram.

1917	..	78 acres.
1919	..	800 ,,
1921	..	3,078 ,,
1922	..	7,000 ,,
1923	..	14,752 ,,
1924	..	20,000 ,,

In other cases, we have evolved our own improved types, and spread them. These have now come into common use all over Gujarat, South of the Narbada, all over Khandesh, over the whole of the Dharwar district, and to a less extent in other parts of the Southern Maratha Country and the Deccan,—and in the '*deshi*' cotton growing area of Sind. The maintenance of these improved types pure means an elaborate organisation for annually producing fresh seed, multiplying this, and then distributing it, but the result has been that in Gujarat the whole area south of the Narbada is rapidly coming to grow one type (1027A.L.) which is highly approved by the trade, and whose growing has been estimated by a commercial authority to mean an addition of 30 lakhs of rupees annually to the amount which would have been received if the crop had remained of the kind it was in 1919. A very similar position has been reached in the southern tracts of the Bombay Presidency, where with the co-operation of the Co-operative Cotton Sale Societies at Hubli and Gadag, quantities of pure seed respectively of improved Kumpta cotton seed (Dharwar No. 1) and of improved Dharwar American cotton seed (Gadag No. 1) sufficient for from 60,000 to 100,000 acres of cotton are produced in each case, and distributed as seed guaranteed by the Agricultural Department, each year. The produce always obtains a substantial premium over the ordinary cotton of the country, and the two together mean almost certainly an increased money value of 30 lakhs of rupees a year.

In Khandesh, the basis of distribution is a high yielding, high ginning type (N. R.) which has become very popular, and means, probably, at least twenty pounds of cotton lint per acre over the ordinary very impure type usually grown. The Co-operative Banks at Dhulia and elsewhere, the Taluka Development Associations and other local bodies are now taking a very active part in spreading this, and it is now grown over an area which can be measured by *lakhs* of acres, though I cannot get exact figures as to the extent.

In Sind, a variety which is very similar to the "N. R." cotton of Khandesh, but which has been locally evolved is the basis of distribution. It has been called "27 WN", it gives 20 per cent. more yield than the local cotton, and we have now an efficient means of multiplying it. At present the demand is far in excess of the supply, and the increase in yield alone by its use means an increase in receipts of many thousands of rupees each year. We have not yet solved here the problem of maintaining its purity when it gets out in the district, but

the matter is in hand and a way will probably be found before long.

So far as cotton is concerned, we have not yet been able to spread suitable improved types of cotton on a large scale in the Dholleras area of North Gujarat or in Broach. But we now have types ready (of which more later), and we are now doing large scale testing of them,—and also of still further improved types in Khandesh and in the Southern Maratha Country.

Rice.—Another crop in which improvement has now been made and is being introduced on a large scale is rice in the north Konkan. Last year we were for the first time able to spread a new type of "Kolamba" rice (No. 42) on 10,000 acres. This type gives an increased yield of twenty per cent. and has been so successful that the demand this year is more than we can supply. Our organisation limits us to being actually responsible for seed for this area, and we are as far as possible taking it into new places each year, leaving the people to keep their own seed for use. On 10,000 acres, it certainly means an increased return of Rs. 12 per acre, or over a lakh of rupees, and the automatic increase will rapidly multiply the return to many times this amount.

Tobacco.—I cannot help mentioning the case of tobacco, in which from selection begun in 1922 at Nadiad, we have succeeded already in isolating a type of high quality (for the Indian market) and high yield, the seed of which has been distributed on a large scale in Upper Gujarat this year. This will be maintained pure, and given out to the utmost of our resources, and means a very substantial addition to the agricultural returns of the Kaira and adjoining districts.

Sugarcane.—Any discussion of improvement of crops cannot leave out a consideration of sugarcane, where much has already been done and more is in immediate prospect. Indigenous cane has almost disappeared from the Konkan in favour of " Red Mauritius " introduced by the Agricultural Department with its better yield and more vigorous growth. In the Deccan Canal areas, the local "Pundia" is an excellent cane,—but some of the new types are in demand at least for special conditions, and we shall soon be faced with the necessity of organising a large scale supply of the seed of a number of new or introduced varieties which we have in hand.

Improved tillage.—The improvement of seed is one way of increasing agricultural yields. Others consist in better tillage

and better manuring. As to tillage, we have found and introduced improved implements in almost every region except perhaps Upper Gujarat, which has very special difficulties. In the black soil areas, iron ploughs of a pattern originally introduced by the Agricultural Department in about 1906 have covered the country, and are made locally on a very large scale by two firms in the Satara District, who now take most, though not the whole of the trade. It would be difficult to measure the value of this introduction, for it means better and more complete tillage, with substantially reduced drain so that the necessary equipment in cattle can be reduced. The cost has now been lowered to an amount within the reach of most substantial cultivators, and this with the organisation of implement societies, the pushing of these ploughs by Taluka Development Associations, and propaganda by the manufacturing firms themselves, is rapidly leading to the replacement of the old Deccan plough. More than 100,000 iron ploughs are now in use in the Bombay Deccan, I estimate,—and the introduction of ploughs means that other improved implements follow in their wake.

In other areas, the introduction of improved implements is slower, but in Sind, at any rate, is now proceeding very fast. The Egyptian and Sarkar ploughs are now in general use and manufactured by every blacksmith in the Jamrao tract,—and though in other parts of Sind they have been found to be only applicable to certain lands, yet for these they are going ahead. In the Jamrao tract it is estimated that the country plough has been replaced completely in the Mirpurkhas Taluka and in parts of the Sinjhoro and Digri Talukas, and to fifty per cent. or more in the remainder of the Digri and the whole of the Jamesabad Taluka.

Ridge cultivation in Gujarat.—The outstanding feature of the last year in the matter of tillage has been the introduction of ridge cultivation on a large scale in the Surat District. This method, which has consistently given 25 per cent. greater yield than cultivation on the flat under the special conditions of Lower Gujarat, has already extended to 1,200 acres, and there is keen interest in the matter, and great demand for help in constructing ridges and in laying out the land for the purpose. I anticipate a rapid development, as the method is applicable to several lakhs of acres, and must yield an increased return of between Rs. 10 and Rs. 20 per acre. A bulletin on this very great improvement is in the press, and a leaflet in Gujarati is under preparation. The credit for working out the method

from my original suggestions on the Surat Farm must go to Rao Saheb Bhimbhai M. Desai and Mr. K. B. Naik.

Manuring.—The other method of increasing crops is by manuring, but, in most cases, the introduction of concentrated manures is an uphill task. Except in sugarcane cultivation in the Deccan, high manuring is not usual in India, but now progress is being made. I may call attention to the gradual increase in the use of the richer oil cakes (groundnut and safflower) in the Deccan for sugarcane, and the more recent growth of the use of Sulphate of Ammonia as the most concentrated manure available for the same purpose. This last material has constantly proved itself the most effective top-dressing for sugarcane that we have, and it is now a regular Indian product. It has been pushed for the last five years, and every help has been given to firms which have taken up the matter. This year the consumption has gone to between two and three thousand tons, and it has now established itself,—resulting in a decreased cost and an increased return.

The use of concentrated manures for cotton (unless under irrigation) has been hitherto almost unknown, but as a result of intensive propaganda in East Khandesh, the use of Castor cake (200 to 300 pounds per acre) as a manure for cotton is becoming very popular and widespread. This is bound to grow, and seems to me the only way of bringing the yield of cotton lint in Khandesh (where it now is only about 100 lbs. per acre on the average) to a figure comparable with that in other countries. The opening for concentrated manures in this area is enormous, for in Khandesh alone the area under cotton in 1924-25 was about 14 lakhs of acres.

Checking Pests and Diseases.—To the sketch which has just been made of a few of the outstanding improvements of recent years, which have already come into use on a large enough scale to make a distinct increase to the value of the agricultural produce of the country, I have only to speak on one other type of work, which has now established itself definitely as a means of increasing production. This is the method of checking pests and diseases, and so preventing the spoilage of much that has been grown.

Wild Pigs.—Of the attack on the larger depredating animals, only that on wild pigs has become widespread. On the canal tracts in the Deccan where wild pigs are concentrated in limited areas, the use of hunting parties has proved itself effective, and the Agricultural Department now maintains

parties which go where they are wanted, their expenses being paid in any area, to the extent of one half by the cultivators themselves. These have been quite successful in the past year, and, the wild pig is not now a present serious menace in these tracts, though they would easily again become so, if they were allowed to multiply.. In the south of the Bombay Presidency, in the neighbourhood of the Kanara jungles, where such methods can hardly give much permanent relief, the method recommended by the Wild Animals' Enquiry Committee of building walls or putting up pig proof fences round large areas (even up to the whole area of a village) is being now widely adopted,—and about ten villages have either partly or wholly enclosed themselves. The result has been very satisfactory, the night watching of the crops is no longer necessary, the value of the land in the enclosed area has gone up in most cases, and there is,—in bad tracts like the Mundgod peta,—a strong demand for much extension of the method. And I look forward to the time when most villages in this area will be protected against the pest. When the enormous loss due to wild pigs is considered anything which acts even as a partial check on their depredation cannot but be regarded as being of very great value.

Smut Disease of Jowar.—Of other crop enemies, the fight against the smut disease in *jowar* by means of seed treatment with copper sulphate is now carried on on a very large scale, material to treat seed for nearly 350,000 acres being distributed last year,—most largely in the Southern Division. This means a saving of crop value of eight to ten lakhs of rupees. A much larger area is being dealt with in the present year, and I hope that this method (designed to save a loss of over 5 per cent. of the total crop) will soon enter into the ordinary agricultural practices of cultivators of *jowar*.

Mildew of Grapes and Koleroga of Betel Palms.—I may refer to two other remedies for crop diseases which have now entered into the ordinary practice of the cultivators on a fairly large scale. The crops involved, grapes and betel-nut—are not large in area, but they are very valuable. In the first case the adoption of spraying with Bordeaux mixture as a remedy for mildew has raised a dying industry in the Deccan to a very flourishing position, and nobody would think now-a-days growing grapes without using the method. The second case the treatment of the *Koleroga* disease in the Kanara gardens by spraying with the same mixture is becoming more and more widespread every year. The people recognise

its effectiveness, and are now buying spraying machines to a considerable extent. There are many other diseases which we are able now to deal by practical methods, most notably perhaps the *tambera* disease of potatoes and chillies, but the progress is slower, and it will be a year or two more before it can be said that these methods have entered into general practice.

SOME IMPROVEMENTS NOW UNDER INVESTIGATION OR TO BE INTRODUCED.

In this brief and very partial sketch I have only dealt with such things as have been discovered by the agency of the Agricultural Department and which have more or less entered into general practice. Now I want to consider those matters which are still under investigation or development, but which have promise of future importance in a similar way.

First let us consider as before the improvement of the crops grown by improvement of the seed, and let us take the important crops one by one.

Cotton.—In four regions we have new types of cotton which have been developed, which we are satisfied represent an improvement, or a still further improvement on what we have issued so far, and these are now being multiplied for distribution. In the Broach area of Gujarat, north of the Narbada, there is need of a type of cotton with a Surat staple, but with a ginning percentage of about 38 per cent. After many years of effort our cotton breeders at Surat (Mr. M. L. Patel) has now got such a type from the progeny of a definite cross made in 1919, and it is being multiplied for distribution. I am hoping that this type will ultimately cover the whole of the Broach tract as our selection "1027ALF" is extending over the whole of Lower Gujarat, south of the Narbada.

In the Dholleras tract, we have two selections from *Wagad* cotton which represent the best staple of that cotton, with a high yielding power and ginning percentage. These will spread very widely as soon as we can multiply them sufficiently. The problem of multiplication in Upper Gujarat presents great difficulties, which have not yet been entirely solved.

In the Kumpta cotton tract, where the cotton though good has an extremely small ginning percentage, the Cotton Breeder in Dharwar (Mr. G. L. Kottur) has succeeded in obtaining from the progeny of a definite cross made in 1918, a type with the Kumpta staple, but with a very much higher ginning percentage and a much better colour. This is being

multiplied at Gokak, and I am hoping to make this a centre of a very important improvement.

In addition to these, the Cotton Breeder in Khandesh, (Mr. S. H. Prayag) has isolated several types of cotton which have very great promise in that region, giving a much better cotton than the best now grown in Khandesh (N. R.), but with equal ginning percentage and yield. This requires mere testing, but next year I hope to be able to speak definitely.

These do not represent the limit of improvement, for our breeders are working with success in obtaining wilt resistant types of cotton in the south, and in the same area in obtaining from a definite cross a much higher staple American cotton than has been hitherto grown capable of growing healthily in the tract. This last piece of investigation is being financed by the Indian Central Cotton Committee to whom our best thanks are due. In Gujarat, any increase in staple beyond what we have reached seems only obtainable by crosses with American cottons. Such crosses present great difficulties, but we are confident of being able to solve them in the near future. In Sind, the whole question of cotton improvement is determined by the fact that with the advent of the Sukkur Barrage water, a very high class American cotton ought to be producible on a large scale, and attempts to find such a type is the basis of most of the work.

Rice.—Next to cotton, more work is now in progress on rice than on any other crop. In Sind at Larkhana, in South Konkan at Ratnagiri, in the Karnatak near Dharwar, our breeders are at work, producing types of rice which will give much higher yields without sacrifice of quality. The work is slow, and has only been in progress for three years, but we think that we have found a type suitable for large areas near Ratnagiri—and also a kind of rice at Larkhana in Sind which has great promise for that area. Our standard is an increase of at least 20 per cent. in yield over the rice now usually grown, and we hope to obtain this in several cases. At Karjat in the North Konkan, as already stated, we are now distributing rice seed of this standard of improvement.

Jowar.—Little has been said on previous occasions about the very important selection work on our premier cereal crop, *jowar*. But very promising results are being obtained both at Surat and Dharwar, and it seems certain that we have now pure types in hand yielding from 15 to 20 per cent. more grain per acre than is obtainable from the seed usually used. We have gone far enough at Surat, to put out seed, provisionalley

on a large scale this year. If it stands the test, we shall have seed for wide distribution in 1926, and it will be a matter of organising the maintenance of a pure supply.

Nachani.—The main crop of the uplands of the Konkan and the Western Ghats is *nachani* or *ragi* (*Elensine corosana*) which seems very susceptible to improvement. Working at a special experimental station in the uplands near Ratnagiri, we seem now to have isolated types which, as in other cases, yield constantly from 20 to 30 per cent. more than the ordinary seeds now in cultivation. I hope to be able to announce in next year's report that types have stood the test and are ready for distribution.

Wheat.—The work on further improvements of wheat is somewhat halting at present, but I may say that in Sind some of the selections from local varieties seem to be what we have been on the lookout for, for use in the *bosi* area. If they stand the test in the present season we shall be able to multiply these for distribution. In Gujarat and the Deccan, I am not satisfied that we have got anything yet which is a great improvement on the Pusa wheats, or on those already locally grown, but the Crop Botanist (Mr. R. K. Bhide), is sanguine that some of the types isolated will fill the requirements.

Such are the research schemes in hand for the improvement of crops by seed selection and breeding. Other schemes for the improvement of crops, some of which are provided for by money provided by the Indian Central Cotton Committee, and by the Sir Sassoon David Trustees are as follows:—

1. *Study of Cotton Boll Shedding at Surat.*—It may not be generally known that over eighty per cent. of the buds formed on cotton plants in Gujarat fall before bolls are produced. The financial loss thus involved is enormous, and the Indian Central Cotton Committee has made a grant of Rs. 25,000 a year for five years to study the question, and to try and reduce the loss. Two years are already passed, and we have succeeded in narrowing down the problem. I feel sanguine that in the coming year we shall get on the track of a method of minimising the loss.

2. *Study of Cotton Boll Worm at Surat.*—The loss due to the Spotted Boll Worm in cotton all over the growing districts is very great indeed. It occurs every year and everywhere, though it is worse in some years and in some districts than in others. The study of this insect with a view to the checking of the damage has been subsidised by the Indian Central Cotton

Committee to the extent of Rs. 15,000 a year. The results of the study in the last two years seem to have shown that the most promising line of attack is the encouragement of parasites of the insects, and work with these is vigorously being carried on. The position is promising, and even a partial stoppage of the pest will be of very great money value to the community.

3. *Study on Cotton Wilt at Dharwar.*—It seems certain that the cotton wilt disease, which kills plants in patches all over the cotton fields is increasing in the Dharwar district, while it is very serious in parts of Gujarat and Khandesh. An investigation of this disease has been subsidised by the Indian Central Cotton Committee at Dharwar,—an amount of Rs. 25,000 having been granted for this investigation, together with that for the improvement of Dharwar American Cotton previously referred to. Very promising results are being obtained. Types of *Kumpta* cotton have been bred which seem almost immune to the wilt disease, and another year will enable us to judge as to whether we are in a way to solve the problem.

4. *Study of weeds, especially the Lavala weed (Cyperus rotundus) and its eradication.*—This investigation financed, to the extent of Rs. 15,000 in three years, by the Sir Sassoon David Trustees has resulted in very marked success. The *Lavala* weed, easily the worst weed of cultivation in Western India, has been studied, and practical methods for its eradication worked out. The scientific results have been published, and the methods are now being experimented with on a large scale.

5. *The Improvement of Grass Lands.*—There are millions of acres of very poor grass land in the Deccan and other parts of the Bombay Presidency which could probably produce far more fodder than is now the case. The methods by which this can be done especially under the conditions prevailing in the Deccan are the subject of the present investigation, which has been subsidised to the extent of Rs. 20,000 by the Sir Sassoon David Trustees. The results so far are valuable. In certain cases such grass lands can be improved by reseeding and the best seed for this has been worked out. In most cases, however, a system of grazing lands by rotation seems the most likely method,—and this matter has now got to the stage of large scale tests. The results to date in both the directions mentioned have been published and are available.

6. *The Improvement of the Potato Crop in Poona and elsewhere.*—This crop though small in area is exceedingly valuable, and has peculiar difficulties in a hot country like India. Diseases abound, and storage is very difficult,—and we are again indebted to the Sir Sassoon David Trustees for financing the investigation of these difficulties to the extent of Rs. 20,000. The results have been of great importance. The potato moth, the great enemy of storage is now shown to be capable of control. The ring disease which almost ruined potato cultivation in the war can now be kept in check. The *tambera* disease, the greatest enemy of *kharif* potatoes can be easily held under control by cheap dusting with sulphur. The problem of storage of seed potatoes, is not yet, however, really solved,—but we are on our way to a solution. A bulletin on the results of these investigations has been published in the last year, and is available.

7. *The Improvement of the Bajri Crop.—Bajri* is the most important *kharif* cereal crop of the poorer lands in the famine districts, and the development of a drought resisting, high yielding type has been the aim of this investigation. It has been financed by the Sir Sassoon David Trustees to the extent of Rs. 20,000. The improvement of the *bajri* crop is faced with peculiar difficulties owing to the extensive cross-fertilisation which always takes place, and also owing to the fact that the crop has never been previously studied. Promising results have, however, already been maintained, but several more years are needed before it will be possible to issue an improved type of seed which really meets the conditions of the famine areas.

8. *The Checking of the Jowar Stem Borer.*—This pest attacking our premier cereal crop is being studied at Surat, again under subsidy from the Sir Sassoon David Trustees. The work is difficult but it has been shown that the methods of attack of greatest promise are those which deal with the hibernating insect in the *Jowar* stubbles and in the *Jowar* straw or *kadbi*. In the former, ploughing up soon after the reaping of the crop kills most of the pests: in the latter, the shredding or even the chaffing of the *kadbi* would get rid of most of the insects, but is not always feasible. Work is going on, and I am sanguine of valuable results in the near future.

9. *The Katte Disease of Cardamoms in Kanara.*—This disease which threatens to destroy cardamom cultivation in Kanara has been traced to its source, and the cause has been clearly made out. It is caused by a protozoae parasite in the soil which can easily be destroyed. Where we are stuck now,

is now to prevent re-infection. This inquiry has been financed by the Sir Sassoon David Trustees to the extent of Rs. 7,000.

These are just a few of the more important investigations in hand or just completed for crop improvement. There are others which demand much time and energy, details of which will be found in the reports of the various Deputy Directors of Agriculture, and of the Economic Botanist to Government. I might, however, mention the work which has been planned on the difficulties of mango cultivation in the Konkan, and towards the cost of which a substantial grant (Rs. 5,000) has been received from the Sir Sassoon David Trustees. This will be actively taken up before the end of 1925.

In looking over the above list of investigations in hand it will be seen to what a very great extent we are indebted to the Indian Central Cotton Comittee, and the Sir Sassoon David Trustees for the financing of investigations which are eminently necessary,but which could not otherwise be undertaken, and I think the thanks of Government are due to the bodies in question for the very large assistance given in this direction.

Investigations on Tillage and on Implements.—Perhaps one of the most important lines of improvement in agricultural practices relates to the use of implements. Almost the first big success achieved by the Agricultural Department was the introduction, a generation ago, of iron sugar cane mills, and the second was the introduction and extension of the use of improved ploughs in several parts of the Bombay Presidency and much can be done further in the same direction, though with more difficulty. Recognising this the Agricultural Engineer has been instructed by Government to devote his time chiefly to the work of designing implements to meet some of our special needs. Two results of his efforts during the present year seem to have reached a practical stage,—namely a cheaper modification of the Orient plough suitable for Sind, and a modified plough share for the iron plough now so common in our black soil areas. These are being tested on a field scale.—A number of other implements for which there is a demand are being worked upon, of which a list is given in the Agricultural Engineer's report. I may note here the close co-operation which is being given by the two large factories of agricultural implements in the Satara district—Messrs. Kirloskar Bros. of Kirloskarwadi and Messrs. The Satara Industrial Works at Satara Road,—in the development and introduction of improvements in implements.

In connection with the improvement of implements in use, I must refer to the important introduction of several ridgers and other instruments in connection with the development of ridge cultivation in the Surat District. So far those we have used have been of American Manufacture, but as the demand increases they will be made here, and we are already testing several such implements made by Messrs. Kirloskar Bros.

A very important piece of work has been recently undertaken by the Professor of Agriculture on the most economical implements needed to get the best results in water conservation in our uncertain tracts. The first year of this work was 1924 and the results are only preliminary, but in this matter we are again indebted to a substantial subsidy from the Sir Sassoon David Trustees.

Some notice will be expected in the present report as to experiments in the use of motor tractors in land cultivation. I may say that we have six such motor belonging to the Agricultural Department. Some are of old pattern, but a new " Case " tractor for use in Lower Gujarat has been purchased during the year. The present position is that there seems no evidence that tractor cultivation is cheap, but it *does* enable the necessary ploughing to be done quickly, and it can be carried out at a time of year when the ground is too hard for bullocks to work. Tractors enable, too, deeper cultivation to be made than would be possible otherwise, and they will probably have great use in ridge cultivation in the black soils of Lower Gujarat. They cannot be used on black cotton soil which is at all moist. In any case the depreciation is enormous, and the point for a purchaser to consider is not only the work that can be done in the first year, but what the machine will do in the second and third year and what its value will be at the end of the latter time when it must usually be scrapped, as an economical implement. These tractors have now reached a very high state of perfection, but we hesitate to recommend them except for special purposes,—and much more experiment under our conditions is still required before we can judge the position they are likely to take in farming in the Bombay Presidency in the future.

Manuring.—I have already referred to the successful development of the use of Sulphate of Ammonia as a manure for sugarcane and of oilcake as a manure for cotton in Khandesh. Both of these have now entered into general practice. More recent successful results are with the use of bone meal for rice

on the red soils of the Konkan, and the use of mixed concentrated manures in the irrigated tracts of the Deccan. But work with artificial manures is a slow business. The materials are relatively expensive, and except for irrigated tracts and those in which the rainfall is very secure, it is hardly safe to recommend their use. And the benefit derived from phosphatic and potash manures is usually very small, as compared with that noticed in temperate countries, even when they are combined with nitrogenous fertilisers. Experiments are continually being conducted, and we are indebted to various firms in India, England, and America for supplies of manures for experiments on our crops, and in particular for quantities of Sulphate of ammonia, Nitrate of soda, and Ammonium phosphate.

Cultivation under Drought Conditions.—One of the main problems, continually before us, is how to secure as good a crop as possible under the very precarious conditions prevailing in many parts of the Deccan and Gujarat,—which includes perhaps the most famine stricken parts of India. Experiments are being made on this problem in several directions. One of these,—the discovery or development of drought resistant varieties of staple food crops has been already referred to. Beyond this, the Soil Physicist is approaching the matter from another point of view,—and is trying to find a method of increasing the retentive capacity of the soil for moisture, and to apply to the Deccan methods of preventing evaporation from the soil. Both these methods promise to be of value. A very considerable increase in the retentive capacity of the soil has been obtained by green manuring and Mr. Tamhane is now hard at work to find the most practical methods of application of the principle. And in the other direction, the system of retaining moisture by thorough preparation of the land and repeated surface interculture of the crops has been found applicable on the black soil of the Deccan and to give in the best cases 30 to 40 per cent. over the average yield of surrounding areas in 1924. The work has, in fact, gone far enough to make me look forward to large scale propaganda in 1926, if the results of the present year (1925) confirm the results already obtained.

Sind Experimental Scheme.—At this point I may refer to the proposals—which are as yet only proposals—for the undertaking of an extensive scheme of experiments, in Sind, in connection with the best utilisation of the many lakhs of acres which will come under perennial flow irrigation on the completion of the Sukkur barrage. The importance of the matter is obvious,

and a committee presided over by the Commissioner in Sind proposed in 1924 that such experimental work should be undertaken at once. A good deal of time has been taken by the Agricultural Department in working out details of this scheme. Government have approved these, and it is intended that the actual work should be undertaken in 1925-26.

Live Stock Improvement.—The work of the Agricultural Department in the direction of cattle improvement consists in the maintenance of herds of cattle of high quality at Karachi (Red Karachi breed, with some Thar and Parkar Cattle), at Chharodi in Upper Gujarat and at Surat (*Kankrej* breed), and at Bankapur in Dharwar (Amirit Mahal breed),—in assisting other bodies to maintain high class herds of cattle, and in putting out premium bulls among the villages of the Bombay Presidency. In the matter of assisting private associations and other bodies who maintain herds of good cattle, I may refer on the one hand to the good work done by the Shirpur Taluka Agricultural Association in Khandesh, who have in the past few years built up an excellent herd of Tapti Khillari cattle, from which bulls of good quality are obtainable. The question of taking over this work and this herd on behalf of Government is now being considered. On the other hand, I must refer to the way in which the Gowrakshaks and other societies for cattle protection have come forward recently to offer their facilities for cattle improvement. Arrangements have been made with Gowrakshaks at Kandivli and Mulund, whereby they maintain herds of pure Gir cattle, the young bulls from which will be put out as premium animals,—the pay of the Manager being borne by Government. The whole scheme was formally launched in the year under report, and promises to serve a very useful purpose.

The other method of live stock improvement is by the putting out of bulls of pedigree stock or of high quality without a definite pedigree, in villages where they stand to serve the surrounding cattle, a record of service being kept, and the support of the bull being, at least partially, paid for by Government. The actual premium bulls now standing for service under this scheme is as follows :—Gujarat 31, Deccan 18, Karnatak 10, and Sind 4. The effect of such premium bulls on the cattle in an area is remarkable, and is so obvious that the demand for premium bulls is rapidly increasing.

PROPAGANDA AND ORGANISATION.

The discovery of improvements is a very small step in the greater part of Western India to getting them introduced.

But the first part of this report shows how this introduction can be and is being brought about in very many cases. The Agricultural Department has its officers in every district whose business it is to secure this introduction, and the number of these has been substantially increased during the year under report. Further in a number of cases, we have now got the very powerful co-operation of the officials of the Revenue Department for the introductions of certain improvements. The extension of the use of copper sulphate as a remedy for smut in jowar in the year under report has been largely the result of their activity.

Again, reliance is now being placed on the enthusiasm of local bodies, the Taluka Development Associations subsidised by Government, to get many improvements adopted and their activities have been very widely effective during the last year. There are now 48 Taluka Development Associations in the Bombay Presidency, and they have, all together, received a Government subsidy of Rs. 24,312. They have been very actively engaged in extending the use of improved implements of many kinds, of improved seed of cotton, wheat and other produce and of methods for the prevention of smut in *jowar* and of other diseases. They have organised shows,—have pushed the formation of co-operative societies for the sale of produce or the purchase of seed, and in one case at least have arranged an admirable system of fodder storage. And, generally, these associations, the first of which was only founded in 1922, have become a very essential part of agricultural propaganda in the country.

In the matter of rural organisation the Agricultural Department works in close co-ordination with the Co-operative Department, as it is the recognised policy that wherever possible any attempt to organise the rural community should be on co-operative lines. Hence the matter of the development of co-operation for the purchase of agricultural requisites or for the sale of agricultural product has a peculiar interest and every district officer of the Agricultural Department may in some sort be looked upon as a Co-operative organiser. The co-ordination between the work of the two departments—Agricultural and Co-operative—is secured by the fact of its being directed in each part of the Bombay Presidency by Divisional Boards of Agriculture predominantly non-official,—which meet once a quarter and control the propaganda and organising work of both departments in the various districts. The gentlemen who are on these Divisional Boards have worked

with enthusiasm and, in many cases, with considerable success and the thanks of Government are, I think, due to them for their disinterested work.

The results of the efforts of all concerned in the matter of co-operative purchase of agricultural requisites has not been great. A few societies exist for the co-operative supply of concentrated manures, seeds and the like, but they do not so far seem to have met much of a realised need. On the other hand it may now be said that societies for the supply of implements of all kinds on hire are an established success in many areas. One of the secrets of their recent success (as against much earlier failure) has been their organisation on a large enough scale to ensure business management.

On the other hand in the matter of co-operative sale of produce, great things have been accomplished and there has been much extension in the year under report. The co-operative cotton sale societies at Hubli and Gadag, existing primarily for the sale of improved cotton derived from seed provided by the Agricultural Department are a monument of what can be done in the co-operative organisation of sale. Their work has extended during the present year, and they have become not only sellers of produce but also growers on a large scale and distributors of improved seed. The organisation for cotton sale in Gujarat is not so advanced, and the societies there simply arrange for the ginning and sale of their members' produce in common, and reserve the seed for further distribution,—but they have much developed in 1924-25. The recent attempts at co-operative sale of *gul* in the Mutha Canal area seems to have become an established success in 1924, and this is an advance on the semi-co-operative method which has been in use in the Nira, Godavari, and Pravara Canal areas for some years, where a branch of the Bombay Central Co-operative Bank has advanced money and supplied manure to local co-operative credit societies, and sold produce on their behalf.

The development of co-operative sale of produce and other farms of non-credit co-operation is bound to be slow. There have been many failures in the past, and these (as is noted by the Deputy Director of Agriculture, N. C. D., as regards the Nasik district) increase the difficulty. But I feel that we are gradually working on to lines which promise success, and I anticipate a large, if slow, growth of this form of organisation.

I might perhaps refer to the very interesting experiment in co-operative fodder storage by the Taluka Development

Association at Athni in the Belgaum District which is, in part at least, a serious famine tract. The matter has only been taken up during the last year, and I reserve a more complete account for next year's report.

Cotton Transport Act.—The working of the Cotton Transport Act during the year under report has not been without difficulty, but has been on the whole a considerable success. In the southern areas, it has completely stopped the mixing of the good cotton at Hubli and Gadag with inferior Khandesh and Persian Cotton, and this is a great advance. I was able to meet the difficulties of the Gadag merchants regarding the traffic in good quality cotton from the adjoining areas in the Nizam's Dominions and Madras to the Gadag Market, and the arrangements have worked well and without friction.

In Gujarat, the difficulties have been greater, but at least the Act has secured that inferior cotton from north of the Narbada cannot now be brought into the Surat area for mixing,—and I hope very soon that the whole of the area south of that river will be growing only one type of cotton. If this can be secured it will certainly lead to a higher reputation for this cotton, and dealing in it with more confidence than hitherto.

Rural organisation.—As regards the general question of rural organisation, little progress has been made or attempted. The present situation in the rural areas in admittedly unsatisfactory,—the land is not producing what it might easily produce,—the labour involved in growing what is now obtained is unnecessarily large,—and yet, there is an enormous amount of spare time to the workers who are compelled to remain in the villages. In attempting to consider the rural reconstruction required it is not one man or one department that is concerned. It involves the consolidation of holdings, the communal or co-operative holding of implements which are beyond the power of individual peasant cultivators, and the development of secondary occupations. The necessity is beginning to be realised, and this is the first step towards that reconstruction which is needed, as a complement to the technical improvement, and the consequent possible increase in produce to which we are now in so many cases able to indicate the road.

SERVICE.

Apart from research and propaganda, there are certain services which the Agricultural Department performs for the agricultural public, the chief being the supply of certain kinds of seed in large quantities and of implements and manures

in certain cases, the boring of wells and the designing of pumping plants, and in recent years the designing of land improvement works for construction by individuals or by co-operative societies.

Supply of seed and Implements.—The supply of seed has been part of the work for the improvement of cotton in Surat, in the Southern Maratha Country and in Sind. In all these cases seed is produced under the Department's own control for a limited area, and this is multiplied either by the Department itself or by a Co-operative Society with the assistance of the staff. The most elaborate organisation for cotton seed distribution is in Lower Gujarat where in the year under report the quantity dealt with was 2,164,600 pounds of seed. This was distributed in the Surat, Broach and Ahmedabad districts, in the Baroda and Rajpipla States, and in certain talukas in West Khandesh while a small quantity was supplied to the Southern Maratha Country. The actual multiplication and distribution of cotton seed in the Southern Maratha Country, beyond the amount needed to grow about 5,000 acres each of improved Kumpta cotton and of improved American cotton, is in the hands of the Co-operative Cotton Sale Societies at Hubli and Gadag respectively and they do it exceedingly well. In Sind the Department runs a small Zemindari at Chellaro on the Jamrao Canal, essentially for the production of pure cotton seed of the best *deshi* type, and 120,000 pounds of seed were produced in 1924. These were placed in the hands of cultivators in the Hyderabad and Thar-Parkar Districts,—and the zemindary gave a profit of Rs. 12,560 for the year.

We have had to undertake the production and distribution of rice seed on a large scale in the North Konkan, as we have guaranteed to give out improved seed for 10,000 acres each year and this will be continued until we can get a co-operative organisation or a private person to undertake it. As new seeds are produced these works will have, probably to become, more extensive, but we shall always be very glad when we can get reliable people or societies to take this work off our hands.

As regards implements, the position of the Agricultural Department has been that the provision of implement depots under its control has been a stage in their introduction, and that such depots should be transferred to the control of local bodies of some sort, preferably co-operative implement societies or taluka development associations. This process of transfer

is going on generally now and the Department's direct work consequently becoming somewhat less important.

Boring.—Boring for underground water is now recognised as a means in some areas of increasing the water available in wells, and in others as a means of finding water where the digging of wells is under other circumstances a very risky undertaking. Hence during the year under report a very large extension of the activities of the Agricultural Department in connection with boring has been under consideration, and a portion of the scheme actually undertaken. The boring machines in the possession of the Agricultural Department were as follows at the beginning of the year under report and on April 1st, 1925, including two which have been lent to the Kaira District Local Board.

	April 1, 1924.	April 1, 1925.
Power boring machines (to 200 feet) ..	9	15
Hand boring machines (to 200 feet) ..	20	14
Exploratory boring machines (to 60 feet) ..	8	30

Since April 1st, 1925, orders have been issued for the further purchase of 16 power boring machines, and the conversion of practically the whole of the hand boring machines capable of going to a depth of 200 feet, to power. Further fifteen more exploratory boring machines are to be obtained, and we may take it that very shortly our boring capacity will be increased three or four times. The organisation of boring in the famine districts has been largely changed also, and the sites, in future, will to a considerable extent be selected by the Collectors of districts, and we shall simply carry out their orders.

The actual number of bores made during the year under report were as follows, and details of each will be found in an appendix.

Division.	Total bores.	Successful bores.	Unsuccessful bores.	Bores in progress.
1. Gujarat	28	17	11	..
2. North Central Division	16	8	7	1
3. South Central Division	56	39	14	3
4. Southern Division	42	28	11	3
5. Konkan	26	16	6	4
6. Sind	..	..	..	..
*7. Famine Boring Scheme	20	2	15	3

* These bores were made on indications by Major C. A. Pogson, and the test of success as in other cases with rock bores, was the pumping of 200 gallons of water from the bore per hour.

The proportion of success is not as high as usual, but is probably as high as can be expected.. The rates charged for boring have been materially reduced during the year under report, and now stand at Re. 1 per foot, for borings to 50 feet and Re. 1-8-0 per foot for depths of over 50 feet, together with the carting of the machines and the supply of labour (and kerosene in the case of power bores) and fuel required for working the boring machine.

Land Improvement.—The loss which annually occurs owing to the run-off from the surface of the water which falls in our famine districts is very great indeed, and there have always been efforts by almost every energetic cultivator to prevent these losses, and to provide irrigation from tanks formed by such run-off water, or to embank valleys so as to increase the water in wells lying below the bund,—or to protect land by terraces or bunds across the surface. Technical skill is not always present, and to meet the need for this two men have been appointed. The first is an engineer whom we call a Land Development Officer whose duty is to prepare small schemes belonging to each of the above kinds. To show the demand for his services I may say that during the year under report,—first year of the appointment, no less than fifty-two schemes were placed before him for investigation. Of these the Poona district was responsible for 9, Sholapur for 18, Satara for 4, Ahmednagar, Khandesh and Nasik for 7, the Karnatak for 7, the Konkan with Kanara for 6 and Gujarat for 1. Of the schemes no less than 21 were for diverting streams for irrigation purposes, 8 were for storage reservoirs, and 12 were for help in making field embankments. The remainder were for miscellaneous purposes. The appointment promises to be of very great value, more particularly for the smaller type of work, and for those which deal with land protection rather than for irrigation schemes as such.

We have also a special man engaged in the Southern Division, who devotes himself entirely to the preparation of schemes for field embankments or *tals*, in this part of the Presidency. In the year under report he prepared plans for twenty new schemes of this character, chiefly in the Gadag taluka of Dharwar (eleven schemes) and in the Athni taluka of Belgaum. Most of these are for private owners, but co-operative bunding societies are being attempted. The whole work is attracting a good deal of interest and attention and the applications for the services of the bunding officer are far more than can be attended to. There seems a great opening for the extension

of work of this character, in areas where water is the most precious commodity a farmer possesses.

AGRICULTURAL EDUCATION.

Agricultural College.—The Poona Agricultural College has now entered on its seventeenth year, and it is as popular as ever. This year there are 85 new students, which is as much as the college can deal with. The total number now in the college is 184. The demand for admission from all parts of India and from many places outside continues, and now the question has arisen as to how far we can continue to accommodate students from outside until all applicants from Bombay have been admitted.

Dr. Burns remained as Principal of the College until May 1925, and on re-opening in June, Rao Bahadur P. C. Patil was appointed to act as head of the College. Various other minor changes in the staff took place details of which will be found in the Principal's Report (Appendix B).

A new professorship at the College,—that of Agricultural Economics has been established during this year and Rao Bahadur P. C. Patil has been appointed to it.

The results of the University Examinations in agriculture were fairly good in the degree examination where out of sixty-four candidates who appeared fifty-nine passed. In the intermediate examination the results were not nearly so satisfactory, for only thirty-six students passed out of a class of sixty-one, five passing in the first class.

During the year the Bombay University has considered, in response to many representations, the revision of the agricultural course at the College, and has finally approved of a draft syllabus recommended by a committee appointed to consider the matter. The main features of the new course are the increased importance assigned to agricultural engineering, the stress laid on agricultural economics, and the reduced amount of specialisation allowed to the students. I think it is an improvement,—and that with this as a guide the college will take a still higher position than hitherto among educational institutions of this type in India and the East.

Agricultural Schools.—The number of vernacular agricultural schools working remains six, as before. These are as follows, with the number of students in each:—

Marathi ..	...	Loni (Poona) 42 Jambul (Thana) 22 Dulia (West Khandesh) 22

Kanarese	.. Devi-Hosur (Dharwar) 26
Gujarat	.. { Godhra 31 { Surat 26

These remain popular and all receive a certain amount of support from District Local Boards, and some from private bodies. The boys leaving them are in demand, and either go to their own farms or are snapped up by others who need lads with such training as we can give. During the year we have been approached to assist in the establishment of an agricultural school at Kopargaon to be conducted by the Ahmednagar District Local Board. An offer has been made by Government to hand over a large part of the buildings on our farm there for the purpose of the school, and this offer is now under consideration.

Agricultural Bias Schools.—The new type of primary schools with an agricultural bias, first established in 1922 has been extended during the year, and we have as a temporary arrangement, continued to train a limited number of teachers to take charge of them, on behalf of the Education Department, at most of our agricultural schools. We also, through the Inspector of Agricultural Schools, inspect the technical work done in these schools. The results so far obtained seem satisfactory, the schools are becoming popular, and there seems a very strong feeling in many District Local Boards and elsewhere to extend their number as fast as teachers trained to the work can be produced.

STATISTICS.

The Director of Agriculture is responsible for the agricultural and price statistics published in the Bombay Presidency, for the forecasts of crops issued periodically during the year, and for the preparation of the Statistical Atlas which should be brought out once in ten years. With regard to forecasts I may say that those issued are increased in number, as forecasts of three new crops have been introduced in recent years. Forecasts for the *bajri* crop, and for both the *kharif* and *rabi jowar* crops were first issued three years ago, and in 1924 for the first time a forecast of the castor crop was brought out, at the request of a number of commercial firms in Bombay.

As regards the Statistical Atlas, this will definitely be issued in November 1925, being based chiefly on the data for 1922-23. The work of compiling it was practically complete in April 1924, but the printing has taken long. It will be of great advantage to have a more up-to-date account of each district (and each taluka) in the Bombay Presidency, for the last edition

of the Statistical Atlas, published in 1906, is based on figures for the years 1903-04.

PUBLICATIONS.

The following publications, representative of the research activities, and, in part, representative of the propaganda activities of the Agricultural Department have been issued during the year.

Memoirs.

The Eradication of *Cyperus rotandus*. A study in pure and applied botany by Dr. W. Burns and Mr. S. B. Ranade. Published by the Pusa Research Institute.

Bulletins.

1. No. 116—Sugar Industry in Western India, and Methods of Sugar Manufacture by Mr. R. G. Padhye, B.Ag.
2. No. 117—Investigation on Fig Culture and Treatment by Messrs. G. S. Chema and S. R. Gandhi, B.Ag.
3. No. 118—Land Crabs as Agricultural Pests in Western India by Mr. P. V. Wagle, B.Ag.
4. No. 119—Year Book of the Agricultural Department in the Southern Division, 1924.
5. No. 120—Silage for Fodder in Western India by Mr. E. J. Bruen.
6. No. 121—Further Investigations in Potato Cultivation in Western India by Dr. H. H. Mann and Mr. W. V. Joshi, B.Ag.
7. No. 72—(Revised) Experiments with the Automatic Water Finder in the Trap Region of Western India by Mr. D. L. Sahasrabudhe, M.Sc., and Dr. H. H. Mann.

Leaflets (with vernacular versions).

1. No. 6 of 1924—Sugarcane.
2. No. 7 of 1924—Top-dressing cake manure to the Rice Crop in Belgaum.

FINANCE.

The expenditure of the Department amounted to Rs. 15,80,950 during the year 1924-25, as against Rs. 15,12,250 incurred in the previous year. The receipts amounted to Rs. 3,28,200 as against Rs. 3,39,000 in the previous year.

As regards the Personal Ledger Account, which is used for financing seed, etc., the total amount advanced amounted to Rs. 1,15,240, while the recoveries credited during the year were Rs. 1,65,125.

Subsidies were received from the Indian Central Cotton Committee, for the pieces of work mentioned in the report, to the amount of Rs. 54,431. And we were indebted to the Sir Sassoon David Trustees for Rs. 15,000 during the year.

ADMINISTRATION.

I was away from India from April to November 1924, during which time Mr. T. F. Main very efficiently carried on the duties of the Director of Agriculture. Shortly after Mr. Jenkins, Deputy Director of Agriculture, N. C. D., returned from leave and also Mr. W. M. Schutte came back from Europe. On my return Mr. Main went away on leave returning in May 1925 to the position of Deputy Director of Agriculture, S. C. D., and during 1925 we have lost, temporarily, on account of furlough, the services of Mr. E. J. Bruen, as Live Stock Expert (whose place is taken by Mr. H. G. Baluch), and Mr. G. S. Cheema as Horticulturist, for whom Mr. H. P. Paranjpye is acting.

During the year we have lost finally the services of Mr. T. Gilbert, who left us, on furlough, preliminary to retirement in September 1924. Mr. Gilbert will always be associated with the development of the operations of the Agricultural Department in the Southern Division where his organising power found full scope, and where the work he did will be long remembered. He had been connected with the Department since 1912, and had seen it grow from very small things to its present extent, and our thanks are due to him for his devotion to the work of agricultural improvement in Western India.

CONCLUSION.

I started this report by saying that I felt more hopeful than ever before that the purpose for which the Agricultural Department exists is being slowly but surely carried out. In the present report I have tried to illustrate the way in which efforts are being made and to show something of the results achieved. The spirit in which most of the staff of the Department are working, ensures, I think, success, and each year now ought to show a more and more rapid rate of progress.

HAROLD H. MANN,

Poona 23rd October 1925. Director of Agriculture.

APPENDIX A.

List of Taluka Development Associations organized up-to-date.

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, 48 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division.

Surat District	1

Khandesh and Nasik Division.

East Khandesh District	5
West do. do.	3
Nasik District	3

South Central Division.

Poona District	2
Sholapur do.	3
Satara do.	2

Southern Division.

Belgaum District	3
Bijapur do.	1
Dharwar do.	5

Konkan Division.

Kanara District	2
Ratnagiri do.	3
Kolaba do.	1
Thana do.	2

Sind Division.

Hyderabad District	3
Nawabshah do.	1
Larkana do.	2
Sukkur do.	2
Thar and Parkar do.	3
Karachi do.	1
	48

Out of the 48 Associations 11 were formed in the year 1922-23 and 27 in the year 1923-24 in the talukas mentioned below :—

Year.		Taluka.		District.
1922–23	.. 1.	Chorashi	..	Surat.
,,	.. 2.	Pachora	..	East Khandesh.
,,	.. 3.	Jalgaon	..	Do.
,,	.. 4.	Madha	..	Sholapur.
,,	.. 5.	Satara	..	Satara.
,,	.. 6.	Khed	..	Poona.
,,	.. 7.	Dharwar	..	Dharwar.
,,	.. 8.	Ron	..	Do.
,,	.. 9.	Gadag	..	Do.
,,	..10.	Chikodi	..	Belgaum.
,,	..11.	Athani	..	Do.
1923–24	1.	Bhusaval	..	East Khandesh.
,,	.. 2.	Raver	..	Do.
,,	.. 3.	Dhulia	..	West Khandesh.
,,	.. 4.	Nandurbar	..	Do.
,,	.. 5.	Nasik	..	Nasik.
,,	.. 6.	Kadwa Canal Development Association Ojhar Tambat (Niphad Taluka).		Do.
,,	.. 7.	Satana	..	Do.
,,	.. 8.	Sholapur*	..	Sholapur. *Ekruk Tank Bagayatdar Sungh.
,,	.. 9.	Walwa	..	Satara.
,,	..10.	Gokak	..	Belgaum.
,,	..11.	Indi	..	Bijapur.
,,	..12.	Mahim	..	Thana.
,,	..13	Kalyan	..	Thana.
,,	..14.	Alibag	..	Kolaba.
,,	..15.	Dapoli	..	Ratnagiri.
,,	..16.	Ratnagiri	..	Do.
,,	..17.	Rajapur	..	Do.
,,	..18.	Sirsi	..	Kanara
,,	..19.	Karwar	..	Do.
,,	..20.	Hyderabad	..	Hyderabad, Sind.
,,	..21.	Hala	..	Do.
,,	..22.	Tando-Allahyar	..	Do.
,,	..23.	Shahdadpur	..	Nawabshah.
,,	..24.	Larkana	..	Larkana.
,,	..25.	Kambar	..	Do.
,,	..26.	Sukkur	..	Sukkur.
,,	..27.	Ghotki	..	Do.

The remaining ten Associations have been formed during the year 1924-25 in the following talukas :—

East Khandesh District.

1. Taluka Edlabad.

West Khandesh District.

2. Taluka Sindkheda.

Poona District.

3. Taluka Junnar.

Sholapur District.

4. Taluka Karmala.

Dharwar District.

5. Taluka Hirekerur.
6. Do. Hangal.

Karachi District.

7. Taluka Karachi.

Thar and Parkar District.

8. Taluka Jamesabad.
9. Do. Digri
10. Do. Mirpurkhas.

Subsidies amounting to Rs. 24,312 have been paid to 30 of the above Associations during the year 1924-25. Subsidies to the following Associations were not paid during the year :—

1. Edlabad.
2. Satana.
3. Madha.
4. Ekruk Tank Bagayatdar Sungh.
5. Satara.
6. Walwa.
7. Karmala.
8. Junnar.
9. Gokak.
10. Gadag.
11. Ron.

12. Aljbag.
13. Ratnagiri.
14. Karwar.
15. Karachi.
16. Jamesabad.
17. Digri.
18. Mirpurkhas.

Out of the above 48 Associations, 43 have been registered under the Co-operative Societies Act and the following five are yet to be registered :—

1. Chorashi.
2. Pachora.
3. Satana.
4. Ekruk Tank (Sholapur).
5. Junnar.

APPENDIX B.

Summary of work done at the Poona Agricultural College for the year 1924-25.

This is the seventeenth year of the existence of the College.

Staff.

Dr. W. Burns, D.Sc., the permanent principal was in charge of the College up to 30th April 1925. He went on six months' leave from 1st May 1925. Dr. Mann, D.Sc., the Director of Agriculture, held charge of the Principal's office till 4th June 1925 when I took charge of the post.

Mr. V. G. Gokhale, L.Ag., Acting Professor of Agriculture, reverted on 8th November 1924 to his post of Deputy Director of Agriculture, Konkan, on being relieved by Mr. B. S. Patel, B.Ag., N.D.D., N.D.A., permanent Professor of Agriculture.

In September 1924, Mr. M. N. Kamat, B.Ag., was appointed Acting Assistant Professor of Mycology. This post was vacant for nearly a year.

In the middle of November 1924 Mr. J. P. Trivedi, L.C.E., had an accident and went on privilege leave for one month. Later on in March 1925 he went on privilege leave again for one month and twenty two days. On both these occasions Mr. A. A. Vasavada, B.Ag., acted as Assistant Professor of Physics and Mathematics.

Mr. H. G. Baluch, B.Ag., Assistant Professor of Dairying, deputed to Bangalore for higher training in dairying was on his return appointed acting Live Stock Expert to Government, from the middle of January 1925. Mr. M. M. Desai, B.Ag., continued to act as Assistant Professor of Dairying.

A chair of the Professor of Agricultural Economics was created from 1st June 1925 and Rao Bahadur P. C. Patil, L.Ag., M. Sc. (Wis.), has been appointed to the Post.

Mr. T. N. Jhaveri, L.Ag., was on leave during vacation. This did not interfere with the teaching.

Optionals.

The Senior B.Ag. students elected optionals as follows :—

	No.
(*a*) Agricultural Economics, Land Development and intensive farming	20
(*b*) Advanced Botany	10
(*c*) Advanced Chemistry	4
(*d*) Stock breeding, feeding and management including Dairying	4
(*e*) Advanced Entomology	1
Total ..	39

Examinations.

Of the sixty-four candidates, who appeared for the B.Ag. Examination in March 1925, fifty-nine passed, one of them in the first class, forty-one in second class and the rest in pass class.

Sixty-one students appeared for the I.Ag. Examination. Of these five passed in first class, thirty-one in the second class and seven in pass class. One of the seven men in pass class was promoted to the Junior B.Ag. last year and had to take an examination in one subject only.

At the final College Examination for Diploma four students appeared, all of whom passed. Ten students appeared for the first examination in Diploma, out of whom six passed in all subjects, two of them securing first class marks. One more Diploma student in the first year, who got exemption marks in three subjects, has been promoted to the Junior B.Ag. Class.

Terms.

Till last year the College used to open on 1st June and close for midvacation on September 15th. It used to reopen on 15th October and close on 10th February.

The University changed the College terms from 1925 onwards as under :—

First Term :—10th June to 30th September.

Second Term :—1st November to 20th February.

The College, therefore, started work on June 10th this year.

Courses.

It had been felt that the course imparted to the students was not quite up to the times and hence the University of Bombay appointed a Committee last year to consider the possibility of improving the Agricultural Course. The Committee met in the College several times and recommended certain changes in the old course.

The Revised Syllabus has been finally adopted by the syndicate and the senate, and the students in the I.Ag. and Junior B.Ag. classes will undergo the course according to the new syllabus this year ; while the students in the final year will follow the old curriculum.

This new course differs from the old in the following ways :—

(1) The I.Ag. students are brought much more in contact with the general aspects of Agriculture.

(2) Some portion of Agriculture which was formerly under Optional Agriculture will now be taught to all men. Some improvements are also made in the general treatment of this subject.

(3) Agricultural Engineering is made compulsory for all students. Much of this was formerly given as an Optional subject, under Land Development.

(4) Each student will specialise in one of the following subjects instead of a large group of two or three related subjects as was formerly the case.

(A) Intensive study of certain crops.
(B) Advanced Plant breeding.
(C) Advanced Agricultural Chemistry.
(D) Advanced Animal Husbandary and Dairying.
(E) Advanced Agricultural Economics.
(F) Advanced Horticulture.
(G) Advanced Plant Pathology.

(5) At the expiry of the second year of study, the students in the Junior B.Ag. class are allowed to take a University examination in Botany and Plant Pathology at their option.

This will reduce their burden of study and the number of subjects for examination at the end of their final year and give them more time to devote to the study of subjects in the final year, and also for more Library and Practical work.

Students.

The College Census was taken at the end of June. The admission fee of Rs. 5 levied from last year has been continued this year also.

Ninety two students (seventy seven from Bombay Presidency including Sind and fifteen from outside) were newly admitted to the I.Ag. Class upto 23rd May 1925, after which date admissions were closed. The policy of admitting men from outside the Presidency after meeting Bombay demands has been kept up, and no Bombay students were excluded in favour of those outside the Presidency upto the final date for admission.

Twenty one failed men (including men for degree and Diploma) 16 from Bombay Presidency and 5 from outside were allowed to rejoin, thus the total number of men on the roll of the I.Ag. Class on the opening day of the College was one hundred and thirteen.

Some of these men thus admitted did not join and some left the College after joining, and hence the number on the roll on the date of census, was eighty five. This number included sixty nine men from Bombay Presidency including Sind and sixteen from outside. The number of Diploma students newly admitted to the I.Ag. Class this year is eight. This forms 9·3 per cent. of the men on the roll on the date of census. As a rule, students from the Presidency proper are not admitted under these special conditions unless they are deputed by a state or an institution.

Besides the above number one student sent by the Director of Agriculture, Ceylon, was admitted directly to the Junior B.Ag. Class as

a Diploma student. He has undergone two years' Course in Agriculture at the Tropical School of Agriculture, Ceylon.

Two more students who failed to join the Junior B.Ag. Class, last year, were allowed to join this year. These two together with the fifty one men passed out of the I.Ag. Class (Degree and Diploma) brought up the total number in the class to fifty three. Out of these, one student left for studies in England and another did not join, leaving a class of fifty one.

At this stage I would like to point out that we had to refuse admission to as many as 85 students. In this connection, I would like to bring out that Dr. W. Burns, before his departure on leave, addressed the Director of Agriculture to provide more Laboratory and Hostel accommodation with necessary equipment for various sections on this estate and I feel that if this is carried out and the necessary additional staff provided for we can take up a larger number of students and will not be obliged to refuse admissions as was done this year.

Amongst the students who were refused admissions there were twenty nine from Bombay Presidency and twenty one from outside. Besides, an intimation to the effect that admission was closed, was sent to thirty five men when sending the prospectus of the College, thus bringing up the number refused admission, to eighty five.

It seems necessary to lay down a policy as to what class of students from the Presidency proper should be admitted to this College. I personally am of opinion that preference may be given as far as possible to students from cultivating class and they should be encouraged to undergo the Course, so that we may get the proper class of men to tackle agricultural problems after they pass out.

Short Course.

Men, who wish one year's training mainly in Practical Agriculture with a small amount of training in the allied Sciences to enabe them to grasp the principles underlying agricultural practice are, admitted to this course. We admitted eleven students this year out of whom two failed to come. There are therefore nine men in this class.

Special Course.

No students applied for such courses in technical subjects this year.

Details.

The details of students for the year 1925 are as under :—

First Year students	..	85
Second Year students	..	51
Third Year students	..	39
Short Course students	..	9
Total	..	184

Out of the 184 students in the College this year, 46 are from Deccan and Khandesh, 47 from Southern Maratha Country and Konkan, 37 from Gujarat and 13 from Sind, making up a total of 143 from the Presidency proper. Out of the 41 foreign students, there are 21 from South India and Ceylon, 5 from Nizam's Domains, 4 from Central India, 3 from Bengal, 2 from Burma, 2 from Travancore, and 1 each from Berar, Central Provinces, Goa and Mesopotamia.

The classification of students also shows that out of 143 students from the Bombay Presidency (including Sind) 32 (or 22·38 per cent.) came from the four chief Agricultural communities of the Presidency *viz.*, Marathas, Lingayats and Jains from the South and Patidars and Anavils in the north, 70 students (or 42·68 per cent) from the Brahmin community and the remaining 82 from Mahomedans, Parsis, Christians and other communities.

Library.

The library now numbers 12,510 volumes, out of which 260 were added in 1924-25.

Other Institutions.

The Diary, Veterinary Hospital, Manjri Farm, Ganeshkhind Garden, etc., continue to be used for the teaching of students.

Inspection.

The University trienial Inspection Committee consisting of Rev. Father Blatter, Principal Mackenzie, Professor P. A. Wadia and Dr. Mann visited this College on 15th December and went round the various sections of the College and Hostel. Their report is now before the Syndicate.

Athletic and Social Activities.

The various departments of the College Gymkhana have been well patronised in their respective seasons. We had a fairly good cricket team and good tennis players. Hockey and Foot ball are the favourite games during the second term. The decrease in the number of Burmese students at foot ball is very much felt.

In the Inter-Collegiate Sports, we have fared much better than last year. We carried off seven cups and a number of prizes and Mr. Bhide of our College was the champion therein. Our students also gave a good display of Boxing. Considering the small number of men from which we have to draw on, we have a very honourable place compared to the Arts Colleges.

The College Platoon of the University training Corps also showed itself quite up to the mark. It was the second best platoon in the camp as well as runner up platoon for Hockey. Besides this, a number of men from our College platoon carried off prizes in the University Training Corps Sports. Four Officers of the University Training Corps belong to the College staff. In the leave vacancy of Dr. Burns, Mr. Sane of our College is in command of the 'D' company.

The Students' Union, an unofficial body representing the students' interest and largely occupied in organizing social intercourse, continues to fulfil useful functions and is a great help to the life of the College.

The Esprit de Corps of the College grows daily : and the twin ideals of the College, Science and sport, continue to be pursued with increasing eagerness. This spirit will not only produce good farmers, but also good citizens.

General.

The College continues to be used as a place of interesting study by various schools and other bodies in Poona. The nature study club, the scouts and the scoutmasters and the members of the male training College utilise it for such purposes.

College Veterinary Hospital.

The number of patients being treated has on the whole increased compared to 1921-22 and 1922-23.

The various improvements in treatment and other methods mentioned in the last year' s report, have been continued with success this year.

P. C. PATIL,
Acting Principal,
College of Agriculture, Poona.

APPENDIX C.

Annual Report on the work done under the Deputy Director of Agriculture, North, Central Division, Nasik, 1924-1925.

Staff and Organisation.

(1) Mr. W. J. Jenkins, Deputy Director of Agriculture, N.C.D., was on long leave from May 1924 to January 1925. During this period, which covers the greater part of the year under report, the charge was held by Mr. C. S. Patel. Rao Saheb B. P. Wagholkar, Cotton Supervisor, Khandesh, went on leave in January 1925. Mr. N. V. Bhagwat, District Agricultural Overseer, Nasik, acted in his post till the end of the year.

(2) The district staff has been reorganised. New centres of work have been opened at Bhusawal and Parola, East Khandesh, Sakri, West Khandesh, and Sinnar, Nasik. An Agricultural Overseer is now stationed at each of these places. The Dang Forest area has now been attached to this Division for agricultural work. A trained kamgar has been appointed to this tract.

(3) The redistribution of the district staff has resulted in more intensive and efficient work. However an increase of personnel is essential to further expansion. The work of the Department must be extended to the important Trans-Tapti tract of Khandesh and to certain remoter talukas of East Khandesh and Nasik districts. To do this new work, additional district officers are required.

(4) The Annual Staff Conference was held at Nasik. Action is being taken on numerous resolutions passed at this meeting. These resolutions include the appointment of " agricultural agents " in selected areas ; the concentration of agricultural improvements in " model " villages ; the standardization of experimental plot records and a fuller co-ordination of the kindred activities of the Agricultural and Co-operative Departments in the Division.

(5) The Divisional staff has worked well. The well-merited honour of " Rao Saheb " conferred by Government on Mr. B. P. Wagholkar, Cotton Supervisor, Khandesh is particularly gratifying and encouraging.

Research and Experiment.

A.—Cotton Improvement.

(6) The Cotton Breeder, Khandesh, commenced his work on Dhulia Farm, West Khandesh four years ago. In this Division, the main object of investigation is to discover a cotton, suitable for Khandesh, which, while equalling the local N. R. in yield and ginning percentage, will be greatly superior to it in staple length.

(7) At the end of the year under report, the Cotton Breeder, had succeeded in segregating and fixing three or four promising strains out of a

complex heterozygous collection of so-called Bani X Comilla hybrids. The next step is an exhaustive trial of these strains, both on Government Farms and on the fields of cultivators, in different tracts of the Khandesh cotton-growing area.

Certain of these strains show considerable promise of providing a profitable alternative to the local cotton. After next season, when they will be grown on a much larger scale, further and more definite estimates of their value will be available.

(8) In addition to this work, the Cotton Breeder is conducting an investigation into the isolation and fixation of Neglectum strains. Only such strains as possess at least one outstandingly desirable feature, are being retained and studied. Such work is directed towards obtaining a more effective combination of yield, ginning percentage and staple length, and is a prudent accompaniment to his other investigations.

(9) In view of the possibility that the limit of improvement by selection from existing varieties may be reached, a collection of strains, suitable as bases for crossing work in the future, is being made. These strains are being maintained and studied on the Farm.

B.—Farm and Experimental Station Work.

(*a*) *Jalgaon Farm, East Khandesh.*—(10) The following average crop yields per acre were obtained on Jalgaon Farm during the year under report :—

Cotton, 127½ acres,—537 lbs. seed cotton.
Groundnut, 20 acres,—1671·16 lbs.
Jowar and Udid, 22¼ acres.
Jowar—758 lbs. grain and 2,279 lbs. kadbi.
Udid—165 lbs. grain and 324 lbs. bhusa.
Wheat 18½ acres.—1,060 lbs. grain and 1,107 lbs. bhusa.
Gram, 2 acres,—948 lbs. grain and 720 lbs. bhusa.
Coriander, 1 acre.—556 lbs. grain.

The high yields of the above-noted crops, grown on the Farm in a none too favourable season, as compared with the yields obtained by the average cultivator, are due, firstly to good tillage, secondly effective manuring and thirdly, suitable rotation. In this connection, the importance of good tillage cannot be over-emphasised.

(11) The question of suitable manuring of the cotton crop in Khandesh has received the attention of the Department for the past few years. The use of castor cake—300 lbs. per acre—has been demonstrated profitable and the use of this manure is rapidly extending amongst the cultivators. As a result of the increase in demand, the price of castor cake is increasing. Therefore, during the year under report several experiments were laid down on the Farm with different manures to endeavour to find an economical substitute for castor cake as a cotton manure.

Without entering into details, the following applications gave promising results when compared with 300 lbs. of castor cake per acre.

(*a*) Groundnut cake—200 lbs.+sodium nitrate—50 lbs.

(*b*) Sodium nitrate—150 lbs.

(*c*) " Ammo-phos "—60—80 lbs.

In view of the great increase of acreage under the groundnut crop in Khandesh, application (*a*) should be of considerable economic importance. There is a growing appreciation among the cultivators of suitable nitrogenous manuring for the cotton crop and any readily procurable manure will be made use of widely.

These experiments are being continued next year. An experiment in increasing the space between the rows of cotton from 1½ to 2 feet resulted in a decrease of yield with a higher ginning percentage.

(12) As complaints had been received of deterioration in the Khandesh groundnut crop, fresh seed was imported from America two years ago. This seed was sown for the second year on Jalgaon Farm. The fresh seed gave an increased yield of 300 lbs. pods per acre in comparision with local seed. The pods were decidedly larger in size.

(13) A series of six wheat strains were tested on a small scale for the Crop Botanist, Poona.

(14) The audited accounts for the year 1923-1924 of Jalgaon Farm, received during the year under report, show a total expenditure of Rs. 51,520-5-0, and a total receipt of Rs. 58,554-3-0, leaving a profit of Rs. 7,033-14-0 on the year's working.

(*b*) *Khed Nursery, West Khandesh.*—(15) The work of preparation of orange seedlings for distribution has not given the desired results and steps are being taken to ensure more efficient and better management of this branch in future.

An important subject of experiment in this nursery is to find out the most suitable times for " budding " in Khandesh.

(*c*) *Belgaon Experimental Plot, Nasik.*—(16) On this plot, last year's experimental work was continued.

Varietal trials of nagli, bajri, wheat and gram were repeated.

The wheat varieties, Pusa No. 12 and Pusa No. 4 are becoming popular in Nasik district.

Good results were again obtained by manuring the chillie crop with a dressing of 400—600 lbs. of castor cake per acre. The increased yield was most noticeable and this treatment is being extended in the district.

A spacing experiment on the bhendi crop gave promise of introducing an improvement on the local system of cultivating this crop. Further confirmation next season is necessary.

Good yields of kharip potatoes were obtained and the cultivation of this crop is steadily increasing in Nasik and Dindori talukas.

The silo, improved cattle byre and noria water lift, erected by the owner, Mr. Jategaonkar, at Belgaon have proved of great interest to the cultivators of the surrounding district.

(c) *District Work.*

(17) Space does not permit of a detailed report of the work of research and experiment carried on in the district. Much of this was in continuation and verification of last year's experimental scheme. It is gratifying to record the assistance given by Taluka Development Associations and private individuals in experimental work under the guidance and direction of the Department.

The following items of experimental work are worthy of special notice, as being most successful and most suitable for bringing to the notice of the public.

(1) *Cotton.*—Manurial experiments with groundnut cake, + sodium nitrate, blood manure, " Ammo-phos " and proprietary cotton fertilisers were conducted on cultivators' fields at several centres. These tests will be continued next season.

(2) *Wheat.*—The use of castor cake and nitrate of soda as a manure for irrigated wheat, was again tried and found satisfactory and profitable. The applications recommended are 300 lbs. castor cake or 150 lbs. nitrate of soda per acre.

In Nasik district varietal tests of Pusa No. 4 and No. 12 wheats were repeated. Both these varieties were found superior in yield to local varieties and also less susceptible to disease. The cultivation of Pusa varieties is extending.

(3) *Rice.*—In Khandesh, an application of 400 lbs. of castor cake per acre to the rice crop was found profitable. In Nasik district, rice variety known as Kolamba No. 42, was tried in Igatpuri taluka, in comparision with local varieties. The former gave an increased yield of over 500 lbs. per acre.

Much success has attended the use of ammonium sulphate as a rab substitute for the rice crop in Nasik district. 600 lbs. of ammonium sulphate was sold to cultivators and it is certain that ten times this amount will be required next season.

(4) *Chillies.*—An application of 400—600 lbs. of castor cake per acre considerably increased the profits from this crop.

This treatment is being recommended to the cultivators and is being widely adopted.

(5) *Other Crops.*—Beet was again grown successfully in Raver taluka, East Khandesh. Its extension is being considered by the local Taluka Agricultural Association.

Nitrate of soda—200 lbs. per acre—gave good results with the garlic and onion crops in Nasik district.

A considerable demand for this manure has been created in that area.

The kharip potato crop was successfully grown in Nasik district, though in Khandesh the rabi crop gave better results, especially in Raver and Nandurbar talukas.

D.—Miscellaneous.

(18) In view of the great increase in labour rates in the Division, research into the production of cheap labour saving implements and machinery is of primary importance. In addition the immense possibilities of increasing crop yields by the adoption of better tillage methods, make the improvement of indigenous agricultural implements and the introduction of new implements suited to local conditions, essential to further progress.

Such work is being conducted with the assistance of the Agricultural Engineer. A set of local implements has been sent to him with suggestions for improvements.

The Mechanical Assistant, N. C. D. is working on a new type of winnowing machine, which will soon be ready for trial.

(19) The protection of crops from wild animals again received attention. Experiments on the poisoning of wild pig in Sakri taluka, West Khandesh were moderately successful. Funds are necessary for the further development of this work.

(20) In concluding this section of my report, I would like to indicate several promising subjects awaiting experimental and research work in this Division. Certain of these have already been taken up, but others, through lack of staff and funds, still remain uninvestigated.

(1) The Wheat crop of the Tapti Valley.
(2) Groundnut harvesting in Khandesh.
(3) Fruit cultivation, including the drying and preservation of fruit.
(4) Sheep-breeding for wool production.
(5) The improvement of inferior millets.
(6) Power cultivation in Khandesh.

PROPAGANDA.

A.—Divisional Board of Agriculture, N. C. D.

(21) During the year under report, the Board held four meetings at different centres in the Division. It continues to prove most useful in focussing non-official interests in the work of agricultural and co-operative development in the Division. The enthusiasm of members both official and non-official remains unabated.

B.—Taluka Development Associations.

(22) In the North Central Division there are thirty-three talukas and petas.

At the end of the year under report, eleven Taluka Development Associations had been formed. That is to say 33⅓ per cent. of the talukas in the Division possess this form of non-official organization for their agricultural, co-operative and social development.

All these Associations are registered—or in process of being registered—under the Co-operative Societies Act. Each one receives an annual subsidy from Government and has engaged one or more fieldmen for propaganda and advisory work amongst their members.

(23) The limitation placed on the length of this report prevents me from detailing, even in a very brief manner, the activities of these associations. Their work includes on the agricultural side, the distribution of agricultural necessities, the demonstration of improvements in methods and material, the hire and sale of ploughs and other implements and, on the co-operative side, the organization of co-operative societies and the advancement of co-operative propaganda.

They render considerable assistance to the Agricultural and Co-operative Departments in the district work.

(24) The two main difficulties by which these associations are faced, are, firstly, the problem of finance, and secondly, the provision of efficient management. The first difficulty can be solved in my opinion, only by the affiliation of these bodies to Taluka Local Boards and by the recognition of their right to a definite percentage of the annual local revenues of the taluka. The present system of finance by the collection of voluntary subscriptions by honorary workers is not satisfactory and most unreliable.

The provision of efficient management is becoming more and more important as the activities of the associations extend.

Training in propaganda work, management of the Association, etc., is essential and should be arranged for members of the Managing Committees.

The future of such Associations depends upon their becoming a real influence amongst the cultivators of the taluka, who must be enabled to enjoy and appreciate the results of the work which is being done.

(25) In most of the Khandesh talukas and in many talukas of Nasik district there exist old "Agricultural Associations" in a dormant or semi-dormant condition. Steps are being taken to revive these and form them into active Taluka Development Associations.

C.—Non-Credit Work.

(26) The District staff of the Agricultural Department continued to give the closest attention to the fostering of non-credit agricultural co-operation.

In this work, much assistance was given by certain Taluka Development Associations.

Pachora Taluka Development Association assisted in the organization of two co-operative ginning societies and one irrigators' society. Attempts were made to organize land improvement societies in Nasik district, fencing societies at Bij, Kalwan taluka and cotton seed societies in Khandesh. The District Agricultural Overseer, Nasik has drawn attention to the necessity for an onion sale society at Nasik.

(27) I cannot overestimate the primary importance of co-operation in the agricultural development of this Division and I consider that it is only through co-operative agency that any real advance in rural development can be made.

The relations between the Agricultural and Co operative Departments in this Division are most cordial and I am glad to report that there exists a growing tendency for closer co-operation between the officers of each department in the interests of the cultivators.

This augurs well for the future.

(28) D—*Departmental Work.*—In both Nasik and Khandesh districts, a large number of major demonstrations were held. In many cases, these were organised with the assistance of Revenue officers or Taluka Development Associations. They were invariably well attended by cultivators and gave a fresh impetus to the spread of agricultural improvements in the localities where they took place.

In addition the policy of holding numerous small demonstrations of such matters, as use of iron ploughs, copper sulphate steeping of jowar seed, etc., was continued and extended.

The chief items demonstrated by the Department were the use of ammonium sulphate for the sugarcane crop, castor cake for the cotton crop, nitrate of soda for onions and garlic and other approved manurial treatment of crops.

Also the advantages of growing better varieties of staple crops such as N. R. cotton. Akola bajri, Pusa wheats, Spanish and Big Japan groundnut and Kolamba No. 42 rice were demonstrated.

All such demonstrations were invariably held on the fields of the cultivators and have resulted in an extension of the practices advocated. Special attention was given to the demonstrations of improved cultural methods and to the use of improved implements.

The intensive demonstration work, carried on to introduce the practice of steeping jowar seed in copper sulphate solution was most successful. It is anticipated that about 30,000 packets will be used during the next year.

(29) Judged by the only real criterion of success, namely the extent to which agricultural improvements demonstrated, are adopted by the cultivators, the year's propaganda work has proved very successful. It is therefore all the more to be regretted that more funds are not made available for this work. A sum of Rs. 700 is totally inadequate for demonstration work in this Division and imposes a definite limit on expansion of this direction, even when non-official assistance is taken into account.

The work of the Agricultural Department does not end in the introduction of improvements as a result of research and experiment. Perhaps its most important function is to ensure that these improvements are incorporated in general agricultural practice. For this work, adequate provision of staff and funds is essential.

Service.

(30) A—*Extension of N. R. Cotton Seed.*—The extension and distribution of N. R. cotton seed was carried out almost entirely through co-operative agencies and the results proved very satisfactory. There are now definite centres in this Division where the extension of N. R. cotton is progressing on regular lines.

During the year under report 25,000 lbs. of pure N. R. Seed, supplied from Jalgaon and Dhulia Farms, was distributed to eight Taluka Development Associations, four Co-operative Credit Societies, and to the co-operative Bank branches at Dhulia and Parola for further distribution to co-operative societies in their areas. Smaller quantities of seed were sent to Poona, Rajkot, Bhavnagar, Dhar, Aurangabad and Indore. Very little difficulty was experienced in getting Taluka Development Associations and Co-operative Societies to arrange for further distribution to their members.

Future work will be conducted on similar lines with the addition of organizing community cotton growing centres with their own ginning facilities.

(31) B—*Implement Depôts.*—The Department maintained sixteen implement depôts in the Division and hire receipts amounted to over Rs. 1,300.

Much of this work is being taken over by Taluka Development Associations and private individuals.

(32) C—*Seed, Manure and Implement Distribution.*—This work also is being taken up by non-official agencies. However there is still a large demand for agricultural requirements which has to be met through the Department. The value of seeds, manures and implements supplied departmentally to cultivators during the year of report shows no signs of diminution.

(33) D—*Mechanical Assistance.*—The Mechanical Assistant visited many parts of the Division and took detailed surveys of pumping sites, etc. He also reported on schemes of power installations, prepared estimates and gave advice to Associations, and private individuals on mechanical projects.

(34) E—*Boring Work.*—There were three boring machines working in the Division during the year under report. Two of these only worked for part of the year as they were undergoing conversion to power machines.

Fifteen bores were completed. Eight of these were successful and seven unsuccessful.

The boring section, as at present organised, is not satisfactory.

There is constant difficulty in procuring labour, the boring mukadams are insufficiently trained and inadequately supervised. I foresee no hope of improvement until all the machines in the Division are concentrated in a small area, *e.g.*, a taluka; until boring mukadams are employed and paid on a temporary basis according to the work done and until the Boring Assistant is empowered to engage casual labour and charge the

cost of the same to the applicant whose work is being undertaken. The present system is thoroughly uncommercial and requires very drastic alteration.

(35) *Education.*—Dhulia Vernacular Agricultural School has completed its second year since opening. The first year course numbered 12 students. The second year, 10, all of whom had successfully passed the first year tests. Six students come from West Khandesh, thirteen from East Khandesh and three from Nasik district.

The Annual Examination was held byMr. K. M. Pawar, Inspector of Agricultural Schools, assisted by Mr. G. S. Moghe, Farm Superintendent, Jalgaon. Eleven first year students and eight second year passed successfully. The students showed weakness in practical work and this side of the training is being intensified.

Rs. 2,625 were collected by the Local Boarding Committee of the school from District Local Boards and Municipalities in the North Central Division. This sum is employed to defray the boarding charges of the students.

(36) It is greatly to be regretted that no advantage has been taken by graduates of Poona Agricultural College of the post-graduate course in farm management and economics, which was instituted last year at Jalgaon Farm. This Farm is a very suitable place for such training and it was thought that this course would fill a want which has long been realised. Up-to-date no graduate has appeared for the course, although applications have been received from others, which are now being considered.

(37) *Conclusion.*—I would like to conclude my report by acknowledging in full the sympathy, co-operation and help received from other departments of Government and the unflagging interest and assistance freely given by many non-official gentlemen, interested in the welfare of the cultivators of the North Central Division.

W. J. JENKINS,
Deputy Director of Agriculture,
N. C. D., Nasik.

Camp Deola, 9th November 1925.

APPENDIX D.

Annual Report of the Deputy Director of Agriculture, South Central Division, Poona, for the year 1924-25.

1. The operations of this Division may be conveniently reported under the following sections—

I. Research.

II. Propaganda.

III. Agricultural Organization—

A. Taluka Development Associations.
B. Non-credit Co-operative Societies.

IV. Agricultural Service—

A. Boring operations.
B. Engineering advice and assistance.
C. Pig killing operations.
D. Famine fodder supply.

V. Agricultural Education.

VI. Departmental Administration.

Section I.

Research.

2. The year under report was on the whole a very good one for the cane crop. This is the second year of the experiments of the newly introduced cropping scheme at Manjri, which consists mainly of the following series :—

(1) Time of application of top-dressing.

(2) Quantity of nitrogen required to produce a heavy crop.

(3) Efficient and economic substitute for Farm yard Manure, *e.g.*, sann manuring.

(4) Suitable crops for rotation with sugarcane.

(5) Quantity of irrigation water and the interval between two consecutive waterings.

(6) Different methods of planting and cultural operations.

(7) Selection of profitable varieties.

(8) Botanical study in the field and chemical control of Gurhal operations.

(9) Study of tillering and root system (new).

The results of the above experiments can be summarized as follows :—

(1) The time of application of fetilizers is a new experiment and hence no definite conclusions can be drawn.

(2) Different amounts of top-dressings were given, supplying 75, 150, 225 and 300 lbs. nitrogen, to different plots to see their effect on the yield; last year the outturns were in the ascending order of the nitrogenous quantities but this year the same grade has not been found to hold true as expected. The variation of the results of this year, therefore seems to be due to some disturbing soil factor. To avoid this the same series have been duplicated, *i.e.*, both on deep soil and medium cane soil this year; the results of which arrangements are expected to assist in clearing up this phenomenon.

(3) The results of this series show that safflower cake alone (substitute of Farm Yard Manure) has given better results, and this corroborates those of last year.

(4) The cycle of crops in this series is not complete and hence no conclusions can be drawn at present.

(5) In the series of water experiments the interval between two waterings and the quantity of water required by the cane crop are the most important. The results obtained for this year and the last year are corroborative and show that the yield increases when the water is raised to 100 acre inches and still more so when it is raised to 125. Similarly the best interval between the two consecutive irrigations has been found to be 8 days. The quantity measurements were taken by the Cippoletti weir and the actual readings with the help of an automatic device (which Mr. V. G. Patwardhan has designed). In actual practice it was found to work very well.

Results of the interval experiments for the year 1923-24.

	Intervals.	No. of waterings per annum.	Quantity of water per irrigation in inches.	Total acre-inches plus rain.		Weight of cane in lbs. per acre.	Weight of gul in lbs. per acre.
				Irrigation.	Rain.		
1923-24.	8 days ..	38	2·16	82·2 plus	13·4	71,978	8,614
	10 „ ..	31	2·57	79·8 „	13·4	52,107	6,003
	15 „ ..	25	3·41	85·4 „	13·4	57,359	6,391

Results of the interval experiments for the year 1924-25.

1924-25.	8 days ..	42	2·1	88·2 plus	25·9	75,780	10,286
	10 „ ..	34	2·45	83·3 „	25·9	73,572	9,113
	15 „ ..	27	3·1	83·7 „	25·9	58,833	8,241

The above figures clearly show that the 8-days interval has got decided advantage over the 10 days and the 15-days.

The total quantity of water required in addition to rain (20 inches) is 95 or even 105 acre-inches, *i.e.*, about 2½ inches per turn of 8-days and 3″ per turn of 10 days interval. The results are given below :—

QUANTITATIVE EXPERIMENTS, 1923-24.

Quantity of water.	Quantity of water per irrigation in inches.	Total acre-inches plus rainfall.		Weight of cane in lbs.	Weight of gul in lbs.
		Irrigation.	Rain.		
75 acre-inches ..	2·57	79·80 plus.	13·4	52,107	6,003
100 „ ..	3·06	94·84 „	13·4	61,730	7,528
125 „ ..	3·72	115·34 „	13·4	75,272	8,850
Results for the year 1924-25.					
75 acre-inches ..	2·44	80·52	25·9	59,996	7,986
100 „ ..	2·90	95·70	25·9	65,749	8,960
125 „ ..	3·70	122·10	25·9	69,829	9,271

The above figures clearly show that the greater the quantity of water used the greater is the yield ; the increment reaching as much as 15 per cent. over the yield on the usual check plot. In this experiment the interval was constant throughout of 10 days.

(6) The results are in favour of four feet method of planting.

(7) The main idea of the whole experiment was to try to find varieties equal to or better than Pundia. In all eight (8) varieties were tried repeatedly for a number of years to test their fitness for cultivation under field conditions. This year three more varieties were selected and these three have proved to be very promising. The results are as follows :—

Name of variety.	Year 1923-24.				Year 1924-25.			
	Weight of cane per acre in lbs.	Weight of gul per acre in lbs.	Extraction per cent.	Brix corrected to 17·5° C.	Weight of cane per acre in lbs.	Weight of gul per acre in lbs.	Extraction per cent.	Brix corrected to 17·5° C.
Red sports ..	74,837	8,128	69·0	16·86	79,492	8,975	68·7	16·50
D. 109 ..	71,563	7,948	62·2	16·15	80,760	8,715	67·6	16·45
White transparent	61,762	8,024	68·5	19·46	66,423	8,186	67·0	18·70
Java ..	63,668	7,137	64·1	18·44	67,119	7,533	64·7	17·60
Manjav ..	41,894	4,863	67·0	17·61	56,794	7,595	72·3	18·80
B. 1528 ..	59,474	7,381	68·3	17·12	75,825	8,196	62·5	16·97
Waxy red ..	60,053	8,153	70·0	19·14	62,037	7,367	65·7	18·61
B. 208 ..	46,745	5,542	64·0	18·60	63,979	7,830	65·8	19·17
Pundia ..	47,926	5,585	71·0	18·50	58,539	7,451	72·3	18·02
H. M. 544 ..	..	..	..	..	90,086	9,098	62·4	17·49
H. M. 600 ..	..	..	..	..	71,053	7,609	62·6	17·38
S. 48 ..	..	..	..	..	75,365	7,895	55·7	19·24

From the results of this year and last, it can be seen that the best four of last year, namely, Red sports, Waxy Red, White transparent and D. 109 have maintained their position this year but some newly selected varieties have gone very high in the list and are equal to or better than the best four of last year, and in particular H. M. 544 is far in advance of all. This indicates that the new selection of this year is another step forward from the standard of the existing selected varieties. H. M. 544 is highest both in the weight of cane and weight of gul and S. 48 which is a high yielder, has the highest brix and purity.

(8) The work of the botanical and chemical study in different experiments with Pundia and other varieties, have been given in the Manjri Station report, and in greater detail in the bulletin on the varieties recently prepared.

(9) Study of thinning of tillers and the selection of seed has been found to be very instructive and interesting. The results show that there is a great scope for getting the highest outturn in Pundia cane by individual selection of seed and for growing the same with thinning the tillers so as to get maximum growth of the remaining canes of the stool. The results are as follows :—

1924-1925.

Name of experiment.	Treatment previous to planting.	Treatment after planting.	Weight of cane in lbs.	Weight of juice in lbs.	Weight of gul in lbs.	Brix corrected to 17·5° C.	Extraction per cent.
Selected sets ..	F. Y. M. 200 lbs. N.	Ammonium sulphate and safflower cake 150 lbs. N. in 3 doses.	106,944	73,968	18,407	18·5	69·1
Unselected sets ..	Do.	Do.	100,473	71,101	12,890	18·4	71·0
Tillers removed at 4 months.	San green manure 100 lbs. N.	Do.	88,281	62,402	12,456	19·4	70·0
Tillers removed at earthing up.	Do.	Do.	76,588	52,284	11,365	20·4	70·0
Check with no tillers cut.	Do.	Do.	58,539	42,273	7,451	18·02	72·3

3. The holding of a sugarcane class is one of the special features of this year, since it was started in the face of many difficulties especially as regards accommodation. The applicants were from all the cane growing districts in the Deccan Tract. The number of attendants was greater than the average of the last seven years namely 31 and the proportion of attendance to the number of applications was much higher, compared with previous years. It can be said that the students who came, went back thoroughly satisfied and completely converted to the improved and economic method of cane cultivation and gul making worked out at Manjri.

The gul produced on this farm ranked mostly as No. I and was valued highly in the market this year. The following is the opinion of the Secretary of Haveli Co-operative Gul Sale Society :—

"This goes to inform you that this year (1925) Gul sent by you to this shop for sale during the Gul season, ranked No. 1 in grade. The Bombay merchants specially preferred to buy your gul so also the Poona merchants for stocking as the same has been found by them to keep the whole year without becoming soft or liquid."

4. *Profit and Loss.*—The cost of cultivation of Pundia cane at this farm per acre as incurred with the Manjri Method of cultivation and usual top-dressing supplying 150 lbs. Nitrogen only, taking into account all items as calculated in a statement worked out on the unit system, comes to Rs. 660-10-6 (with the cost of the unit of labour taken as annas eleven, being the prevailing rate this year).

The income obtained was Rs. 1,118-6-0 per acre taking the average sale rate of gul obtained during the whole season namely 8 lbs. per rupee; and the average yield of the whole area was 36 pallas of gul per acre. The net profit per acre amounts to Rs. 457-11-6.

5. In connection with the central Research sugarcane station at Manjri the Department has a confirmation station at Baramati to serve the Nira Left Bank Canal. On this station results worked out at Manjri are confirmed or modified under local conditions; and part of the area serves the purpose of demonstration of improvements found suitable for this canal tract.

In the year under report a new series of confirmation experiments was laid out and hence the results obtained require to be verified in subsequent seasons before being published.

Similarly on the Godavari Canal a part of the Department's fodder farm at Kopergaon is used as a confirmation area for that tract. The following statement summarizes the results of five years trials conducted on the Kopergaon Farm from which it will be seen that the three marginally noted varieties stand in front of Pundia, the standard variety.

Red sports.
Manjav.
B. 376.

In addition to these varieties eight more varieties were under confirmation trial for the first time in the year under report—out of which D. 109 with a yield of 9,208 lbs. of Gul per acre and Java with a yield of 7,820 lbs. did best.

No.	Name of variety.	No. of canes per acre.	Weight of canes per acre in lbs.	Weight of gul per acre in lbs.	Nos. arranged according to yield.
1	Red sports ..	29,115	91,631	9,061	1
2	Manjav ..	22,717	91,671	8,574	2
3	B. 376 ..	25,674	76,980	8,239	3
4	Pundia ..	26,204	74,312	8,116	4

Section II.

Propaganda.

(6) The principal items of the programme of the district staff are as under :—

(1) *The popularisation of the copper sulphate treatment of Jowar against smut.*—In this connection a concentrated effort was made in co-operation with Revenue and Irrigation Officials in almost all the districts. In the Ahmednagar District 7,191 packets were distributed in the dry tract through the Revenue Department and demonstrations of steeping were conducted in 42 places. The Collector Mr. Smart rendered very great help with the result that every Mamlatdar took a prominent part in these operations. In the Sholapur District 3,378 packets were distributed while the Madha association distributed 1,000 packets. In the Poona District in all 2,084 packets were distributed and in the Satara District 833 packets were sold. In the canal tract 6,868 packets were sold on the Nira, Godavari and Pravara Canals with the help of the Irrigation Department. Thus the total number of packets distributed in the S. C. Division came to 21,354.

(2) *Introduction of new crops and varieties.*—The principal work in this respect has been the introduction of N. R. cotton into Ahmednagar and Sholapur Districts and the introduction of new ground-nut seed in the Satara and Poona Districts and the dissemination of Akola Bajri throughout the Deccan.

The work of the N. R. cotton is concentrated in the Sheogaon and Newasa Talukas from 1922. The seed is well appreciated by the people who are willing to pay good prices for the best seeds but unfortunately, pure seed could not be made available from Khandesh and hence 12,000 lbs. of second class seed were distributed in the year 1924-25. It was given to seven cultivators on condition that they would gin their produce and supply that seed to other cultivators but on account of the failure of the cotton crop only 5,000 lbs. of seed could be secured.

For the new season of 1925-26, 2,000lbs. of second class seed was again secured and distributed to seven different cultivators of Sheogaon and Newasa Talukas. At present the area of these seed growers is 150 acres from which the supply for future year will be available. The District Agricultural Overseer is now trying to solve the problem of the N. R. seed supply by inducing the tenants of the Belapur Syndicate to take up the production of the first class seed and a beginning is made in June 1925 with one of these men who has sown 30 acres with pure N. R. seed from the Jalgaon Farm.

The Department, in this connection, with its policy of advocating a diversification of cropping on the Deccan Canal, is recommending the introduction of this crop. It seems that in view of the peculiar economic condition of the sugar cane industry it will soon be necessary to grow some other remunerative crop on the canal area and perhaps cotton will

be found the most suitable crop for large scale adoption. The Irrigation Department has recently reduced the water rate to rupees three per acre or this monsoon crop and consequently the area under cotton on the canal tract has been increased from 300 to 1,000 acres.

N.R. cotton is increasing its popularity in the Sholapur District especially as an irrigated crop. This crop responds well to irrigation and manure. During the past season a plot at Wakhari near Pandharpur yielded at the rate of 2,400 lbs. of seed cotton per acre. The marketing of cotton is not well organised in this tract but through some intelligent cultivators the Department was able to distribute 22,000 lbs. of seed during the year. Cultivation of cotton under irrigation raises the problem of manuring and a trial is being made to experiment with the application of sulphate of Ammonia in co-operation with the Union Agency.

As regards ground-nuts, the crop is important in the Poona and Satara Districts. The existing varieties are very late and require irrigation for a longer period. In order to replace a late variety by an early one four demonstration plots of the new variety were arranged in the Junnar Taluka and Ambegaon Peta and their yield vary from 1,440 to 2,400 lbs. per acre. All these seed growers have reserved their produce for the sowing of next season. In the Satara area the local ground-nut has become mixed and degenerate and accordingly in the year under report fresh consignments of 11,112 lbs. of big Japanese and 4,156 lbs. of Pondicherry varieties were imported by the Department. A large quantity of these seeds was issued to the Walwa Taluka Development Association for distribution and multiplication. 2,481 lbs. of Pondicherry seed was distributed in the Karad Taluka and the remaining quantity was given on the canal tract (Nira Canal).

On comparison of the newly imported big Japan seed with the acclimatized variety, it was found that the nuts and kernels of the new seed were more than twice as large as those of the old variety and the percentage of oil of the former is lower than that of the latter.

As regards Akola Bajri picked from Deothan and Virgaon villages, the seed proved advantageous everywhere in the Deccan. During the year 2,000 lbs. were supplied to other districts.

New Varieties of Sugarcane.—On the Manjari research station half a dozen promising varieties were found and they were tried in the fields of selected cultivators on different canals. The general impression is that each tract will require its own variety of cane. The trials conducted by Mr. G. G. Shembekar of Baramati resulted as shown below :—

	Variety.	Yield of cane per acre.
		Tons.
1.	Red-sport	53
2.	H. M. 544	48
3.	Pundia	45
4.	Manjav	44
5.	Red Mauritius	42

The cost of production amounted to Rs. 855 per acre. Mr. Shembekar is satisfied with H. M. 544 and its cultivation is extended by him in 1925-26.

On the Godavari canal Manjav found favour with irrigators and the area under this variety was 100 acres. It is a shy-stooler variety and does not profit from the wide spacing recommended for Pundia. It is anticipated that this will prove useful for Adsali cultivation as it matures earlier by two months than Pundia.

The Department is popularising turmeric on the canal areas and potatoes in the Nagar district. The yields of Italian potatoes varied from 6,000 to 7,500 lbs. per acre.

Implement—Implement Depôts.

(3) Much of the work of the department in this connection has passed into the hands of other agencies. The Department encourages the organization of implement co-operative societies and the implement depôts will have to be closed as soon as the societies are organised.

The following list summarises the working of the Government Implement Depôts in the year under report :—

Name of District.	Name of Taluka.	Name of Depot.	No. of implements stocked.	Amount of hire charge realized in rupees.	Remarks.
Ahmednagar ..	Sangamner ..	Nagar ..	11	289 12 0	
		Sangamner ..	4	57 9 0	
	Shrigonda ..	Pimpalgaon Pisa	12	57 4 0	
	Newasa ..	Newasa ..	12	25 14 0	
	Kopargaon ..	Kopargaon ..	17	29 2 0	
		Derda ..	15	44 9 0	
		Shirdi ..	17	28 7 0	
	Rahuri ..	Rahuri* ..	..	1 8 0	* Closed and implements removed to Belapur.
		Belapur ..	9	25 1 6	
		Kolhar ..	42	113 4 9	
		Khandala ..	18	119 15 0	
Poona ..	Bhimthadi ..	Baramati ..	16	120 14 0	
		Vadgaon ..	4	8 12 0	
	Indapur ..	Bavda ..	7	39 10 0	
Satara ..	Walwa ..	Islampur ..	7	4 2 0	There was no demand for implements on hire.
	Koregaon ..	Koregaon ..	14	82 4 0	
Poona ..	Haveli ..	Khed-Shivapur ..	16	178 3 3	
	Junnar ..	Narayangaon & Ghoda.	11	47 8 0	
	Purandhar ..	Pandeshwar ..	9	5 13 0	
	Khed ..	Peth ..	4	26 8 0	

The tendency in the management of depôts and societies during this year has been the reduction in the higher rates charged to the cultivators. The Sheogaon society has lowered its charges from three annas to two annas per plough per day on account of competition of other societies. There are now 6,000 iron ploughs in the Ahmednagar District against 1,500 in 1920 and 200 in 1915. We have still however a long way to go as the number of ploughs (wooden) is estimated at 37,000.

(4) *Tractor ploughing.*—Owing to the success of the iron plough in the Nagar district arrangements were made to conduct tractor ploughing on a large scale at Sheogaon. A case Tractor and a three furrow Grand Detour plough were placed in this Taluka, and the technical operations were managed by the Agricultural Engineer, while the business arrangements were done by the Deputy Director of Agriculture. Indents for ploughing the land were readily forthcoming and the rate of ploughing per acre was fixed at Rs. 8. The actual performance of this tractor was most disappointing as the plough broke several times during the operations. In all 91 acres were ploughed with this tractor during this season. When the machine was working satisfactorily the tractor could plough 3 to 4 acres per day to a depth of 7 to 8 inches. The working expenses came to about Rs. 7 per acre excluding the overhead charges.

The public are keenly interested in the tractor work and the District Local Board (Ahmednagar) has purchased two Cletrac Tractors costing Rs. 5,500 per set. One of these machines has ploughed more than 100 acres in a couple of months and the cost of ploughing did not exceed Rs. 6 per acre to the Local Board.

(5) *Spraying operation.*—The potato crop in the Khed Taluka was affected by the Tambera disease and the Department took prompt action in spraying this crop in 13 villages in the fields of 30 cultivators. The effect was excellent and the treated crop escaped all damage.

The lucerne crop was also affected with aphis in the Nagar district and in five villages about 35 acres of the crop was sprayed with Fish oil and Rosin soap wash. This has also proved very effective.

In the Satara District chilies were affected with leaf curl disease and the Department sprayed the same with lime and sulphur wash. It had an excellent effect and the plants put up new growth and the yield was satisfactory. Similar work was done in Poona and Sholapur districts with equally good results.

(6) *Horticultural Operations.*—Ahmednagar District is famous for its orange and Mosambiques and their cultivation is extending. During the year under report 1,500 new plants were supplied in six villages while in the Nagar Taluka 4 new grape gardens have been laid out. The Agricultural Overseer reports an interesting method of protecting the grape from mildew in vogue in Pimpalgaon Ujjain. A second light pruning is conducted in November when the tender vines are again pruned at the 5th or 6th internodes from the bunches so as to force all the sap into the fruit. The object is to remove the most susceptible foliage to mildew, *viz.*, tender growth.

(7) As regards the methods adopted for conducting propaganda they may be summarised as follows :—

1. Organised shows. 2. Implement demonstrations. 3. Manurial demonstrations. 4. Trial of new crops. 5. Steeping, spraying, etc. and 6. Organisation of depôts and implements societies, seeds and manure societies, etc.

A summary of the work done in each district is given below :—

Poona District.—During this year a show was held at Dehu in the Haveli Taluka and a Magic lantern lecture was given at Nighogi. Eleven implement demonstrations were conducted in the Junnar Taluka where the iron plough is not yet popular. In the Manjari village trials of (1) sulphate of Ammonia and castor cake, (2) Ammo. Phos. plus castor cake and (3) Union Agency's complete fertilizer were made in which the standard combination, *viz* :—(1) proved economical. In the Ambegaon peta, demonstration plots of Sulphate of Ammonia farm yard manure and cake combined together, proved advantageous to the cane crop and the profits varied from Rs. 100 to 150 against an expenditure of Rs. 22 per acre.

Ahmednagar District.—A very successful demonstration of the Manjari system of growing cane and Gul making was conducted at Akola where four plots were laid out. In the same taluka Satara method of growing tobacco was shown. The ridge system of growing lucerne and inter-culturing Jowar also proved successful. A large demonstration was organised at Akola which was attended by 200 cultivators.

Satara District.—In the Satara District the demonstration of improved furnace for Gul making was shown in 12 different places in which the saving of fuel and time was shown to the public. The Department opened a stall at Koregaon at the time of Maratha Educational conference and an exhibition was arranged at Satara and Bhose at the time of Provincial and Co-operative conferences. It is a common belief among the cultivators of Krishna Canal that ground-nut cake produces softer Gul than that of Karanj Cake. Trials of ground-nut, safflower, Karanj cakes were made at Wadgaon on equal money basis and their results are given below :—

Name of Cake.	Brix test.	Weight of Gul in lbs. per acre.	Remarks.
Karanj ..	21	9,840	Colour rather reddish, consistency hard.
Safflower ..	21	10,780	Colour yellow much better than that of No. 1. Texture more crystaline.
Ground nut ..	20	8,640	Colour rather reddish but consistency not soft although the canes were taller and rather softer in crushing.

Sholapur District.—The work was much hampered on account of bad season ; however implement demonstrations were conducted in 9 villages and artificial manures worth Rs. 600 were distributed. Silos were constructed at Sholapur and Wakheri in September and were packed

with the hundi Jowar. The silos were opened in February and the stuff was found very delicious.

SECTION III.

Agricultural organisation.

A

(8) *Taluka Development Associations.*—In this division there are 7 Development Associations at Satara, Walwa, Madha, Ekruk Tank, Karmala, Khed and Junnar. Out of which the Walwa and Madha Associations have done good work. The chief work of these Associations consists in (1) purchase and sale of fodder, (2) distribution of superior cotton and wheat seed, (3) spraying of chilies against leaf curl, (4) Proposal for building dams, (5) Demonstration of steeping Jowar and Manjari furnace, (6) Cooperative sale shops and cattle shows. It is a very creditable performance but it is doubtful how far the average cultivator will appreciate the same. The Taluka Association is now working for 3 years, and it is possible to put forward some general conclusions about its working. The financial resources should be substantial and the overseer should not merely be a technical but also an experienced officer. There should be substantial enthusiasm among the people of the Taluka. Hitherto no Association has succeeded in collecting locally 1,000 rupees and hence it is desirable that some form of cess should be levied to finance such Associations along with the land Revenue. The Government should raise its maximum contribution to twice the local subscription. With regard to the calibre of the Overseer a Loni School boy is far below the mark in carrying out the work of these Associations. He cannot command the confidence of the general cultivators. It is therefore necessary that the Overseer should be a man of 5 to 10 years' experience with a salary of not less than Rs. 70. Further work depends upon the enthusiasm of the people which would undoubtedly render the work easier in the introduction of improvements. The Association should at least hold one general meeting per year and one quarterly meeting of the Managing Committee and should maintain the necessary records.

SECTION III.

B

(9) *Non-credit societies.*—On the 1st of April 1924 there were 32 non-credit societies on the list. During the year, one sale society and one implement society were cancelled and two implement societies and water distribution society were added thus leaving the balance at 31 by one the end of the year.

It is now becoming generally realised that a non-credit society cannot be really successful unless it operates over a large area. The small societies of a single village seem to have little future. In this connection I may quote the work done in Nagar District in organising Implement societies. These have proved very successful. At Sheogaon Mr. Gadgil has organised a very successful society with a share capital of Rs. 4,800. A stock of 128 iron ploughs is kept for hire and two branches have been

opened in the Taluka. During the year 320 cultivators have hired these ploughs and the earnings amounted to Rs. 1,450. The reserve fund stands at Rs. 300 and the last dividend was 12 per cent. In the year under report two more implement societies have been organised at Pathardi Mahal with a capital of Rs. 2,000 and a stock of 70 ploughs and at Jamkhed with a capital of Rs. 852 and with a stock of 55 ploughs. In a short period of 5 months the Pathardi society realised a profit of Rs. 852 and the Jamkhed society collected a hire of Rs. 460. There is still a great scope for development of these societies in future.

Section IV.

(10) *Agricultural service.*—The service under this head can be mentioned in the following items :—

A. *Boring operations.*—In the year under report 6 machines were working in the Poona and Sholapur district and one machine was handed over to the Mamlatdar of Shrigonda. In all 53 bores were made of which 39 were successful, and the total footage was 3,324 feet. The details of the working of these machines is tabulated below :—

The details of the working of each of the machines is tabulated below from 1st July 1924 to 30th June 1925.

Machine No.	Idle for want of		Working days.	Average work done per day.	Number of bores in the year.			No. of feet bored.	Amount of bills for bores.	Remarks.
	Coolies and Holidays.	Repairs accident transit.			Successful.	Unsuccessful.	In progress.			
Poona District.									Rs. a. p.	
P. Machine No. 18.	49	120	196	3′ 7″	11	..	1	701′ 11″	1,466 13 0	
H. Machine No. 25.	86	32	247	2′ 0″	1	7	..	498′ 7″	430 5 0	
H. Exploratory Machine No. 5.	2	12	11	1′ 3″	1	..	..	16′ 6″		
P. Machine No. 8.	27	113	99	4′ 6″	...	7	..	449′ 3″	843 9 0	Transferred to the Mamlatdar of Shrigonda on 24th February 1925.
Sholapur District.										
H. Machine No. 17.	13½	40	311½	3′ 9″	18	..	1	1,159′ 6″	1,926 0 6	
H. Machine No. 28.	44½	99	221½	2′ 3″	8	..	1	499′ 0″	772 8 0	
	..	..	1,086	..	39	14	3	3,324′ 9″	5,439 3 6	
Average work done per machine in the year 554 feet.										
H. Machine No. 13. Madha.	29	14	48	1′ 11″	2	..	..	94′ 6″	231 0 0	
Pandharpur ..	..	39	52	3′ 0″	2	..	..	156′ 6″	....	The machine is lent to the Implement Society, Pandharpur, from November 1924.

P. :—Power bore machine, H. :—Hand power machine.

SECTION IV-B.

(11) *Engineering advice and assistance.*—The mechanical Assistant has been looking after the plants at Manjari, Loni and Kopergaon and is rendering assistance to private plants of the mofussil. The power sugar cane crusher is becoming more popular and there are at present 19 crushers working on the Deccan Canals. The Department has kept three power mills for hire and the following remarks summarise their work.

The 44 Chattanooga Mill.—This was hired to the Chief of Kagal and its average out-turn of juice per day was sufficient for 18 pans. The hire charges recovered came to Rs. 328-5-0. This machine was also given to His Highness the Maharaja of Kolhapur where it crushed 16 acres of cane in 23 days. The hire received was Rs. 73-5-0.

The 92 Chattanooga Mill.—This was hired to Kholhar Co-operative Society and it worked only for 75 days. The cane crop of this tract was very poor and the area crushed was 50 acres. A concession rate of hire charge was Rs. 3-8-0 per day. The daily out-put was only 18 pans.

The Ruston Proctor Mill.—This mill was hired to Mr. Borawake of Mamadapur and it crushed 95 acres of cane in 117 days. The recoveries came to Rs. 380-4-0. This mill produced juice sufficient for 31 pans per day. The maximum number being 48 in a working day of 20 hours. The performance was very good.

These experiments have proved successful and led private individuals to purchase similar plants for crushing cane and pumping water. Mr. Krishna Khandu Patil of Manjri has purchased Chattanooga Mill No. 45 and seven B. H. P. Blackstone engine costing Rs. 3,350 which were installed in Hadapsar village. The same gentleman again purchased another mill and a four-inch centrifugal pump with the help of the Department.

There are considerable number of pumping plants in this division and the Mechanical Assistant rendered assistance to six of these plants. Two new installations of pumping plants were made during the year at Kamshet and Manjri.

SECTION IV-C.

(12) *Pig killing operations.*—As a result of the recommendations of the wild animals committee's report a special Officer was appointed to undertake the campaign of pig-killing. On the Mutha canal people of Nanded and Wadgaon decided to engage a Shikari for attacking the pigs on moonlight nights. Three hunting parties consisting of Vaidus and dogs were organised on the Godavari canal. These men were paid at the rate of 1 to 2 rupees per pig killed according to the size of the animal. The operations were done under the control of Mr. Bhide. Experience shows that shooting is necessary for animals above two years old. On the Nira canal the pigs are few in number but large in size and hence shooting with the gun is more successful,

The following statement summarises the work done during the last six months :—

Canal.	Animals killed.		Animals wounded and escaped.	Total expenditure on beaters dogs and ammunition.	Cost per kill.	Remarks.
				Rs. a. p.	Rs. a. p.	
Mutha ..	29 pigs 1 porcupine 2 Jackals 2 Do. poisoned	34	49	204 0 0	6 0 0	Mostly work in moonlight " Lying in wait ".
Godavari ..	112 pigs 1 jackal	113	21	169 0 0	1 8 0	Mostly work of dogs and spears.
Nira ..	10		4	196 2 2	19 6 2	Mostly work of guns.
Total ..		157	74	569 2 2	3 10 0	

13., Another line of action which has been followed has been the purchase of material for the construction of a pig proof demonstration fence. This fence which is a mile long will be erected very shortly near Khadakwasla. It will enclose an area containing some 16 acres of sugarcane and other crops where very considerable damage is liable to be done by pig. A recent piece of damage was shown to the writer where cane to the estimated value of Rs. 200 had been done in an area not exceeding a fraction of an acre.

This fence will be paid for by the Department in the first instance but the landowner will bear the cost of erection and will have the option of purchasing the fence outright within a period of six years.

Section IV-D.

14. *Famine fodder supply.*—The operations conducted at Kopergaon farm for the last ten years have been found unsuitable for the supply of fodder on account of the scarcity of manure ; hence no shredding and baling of Kadbi was done during this year. The total quantity of dry fodder produced on the farm was 203,658 lbs. which was issued to parts of famine stricken talukas of the Satara District. The following statement summarises the Kopergaon fodder store operations during the year under report.

Serial No.	Name of fodder.	Receipts.			Disposal.	
		Balance in hand on 1-4-1924.	Quantity received during the year.	Total in lbs.	Sold.	
					Quantity	Price.
		Lbs.	Lbs.	Lbs.	Lbs.	Rs.
1	Nilva and Jowar Fodder.	623,620	238,451	862,071	578,087	12,106

Serial No.	Name of fodder.	Disposal—*contd.*				
		Distributed free.	Shrintage in lbs.	Total in lbs.	Balance on 31-3-1925	Fed to Farm Cattle.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1	Nilva and Jowar Fodder.	50	20,357	614,182	247,889	15,688

Section V.

Agricultural education.—The Marathi agricultural school at Loni was run on the same lines and a course of agricultural economics has been added to the curriculum. 24 boys were admitted to the first year course during this year and there were 18 boys in the second year. Out of the total 42 boys, 28 are Marathas and 14 Brahmins. With regard to boarding arrangements two clubs have been formed (1) for vegetarians and (2) for meat eaters and the students undertook the management; so far the club system is working quite satisfactorily. In the annual examination, out of 18 boys of the first year 16 have passed and in the second year 16 boys have come out successful from the same total. The expenditure of the year amounted to Rs. 14,855-1-10 and the farm receipts came to Rs. 1,809-11-11.

The training of primary teachers for the agricultural bias schools was conducted and six teachers from Poona, Nasik, Satara, Sholapur, Nagar and East Khandesh have been admitted in the class. Three batches of teachers have now passed through the course and they were attached to the following primary schools:—1. Peth. 2. Mohol. 3. Deolali. 4. Asoda. 5. Kusumba. 6. Narayangaon. 7. Ozar. 8. Kognoli. 9. Rahuri. 10. Kale. 11. Dabhadi. 12. Kem. 13. Wadgaon.

SECTION VI.

5 *Departmental Administration.*—At the close of the year Rao Bahadur P. C. Patil, Deputy Director of Agriculture in charge was transferred to the Agricultural College as Professor of Agricultural Economics. He was succeeded by the writer of this report who takes this opportunity to point out that the year's work was controlled and directed by him. In June Mr. Joshi took over the charge of boring Assistant in place of Mr. Deval.

A special feature of the year under report was the suggestion of Government to devise ways for greater co-ordination of the Revenue and Agricultural Department for propaganda work. At the meeting held under the Commissioner, C. D., it was arranged that a conference of the Agricultural and Revenue officers of each district should be held under the guidance of the Collector in which the Agricultural Department should explain what work it was undertaking in each district and how the Revenue Officers could best help the propaganda work. Accordingly the meetings were held as follows :—

Ahmednagar	..	22nd December 1924.
Satara	..	15th January 1925.
Poona	..	3rd February 1925.
Sholapur	..	14th May 1925.

16. The Divisional Board met four times during the year and its chief work consisted of recommending the applications for loans for Agricultural improvements, and organising the taluka Development Associations and in carrying out the work of the district staff of the Agricultural and co-operative officers.

The following statement summarises the loans recommended, during the last two years :—

Year.	Number of societies applying for loans.	Total approximate amount recommended by the board.	Total amount sanctioned by the bank.
		Rs.	Rs.
1923-24	1	8,100	2,500
1924-25	41	1,38,185	67,550

Refusals to sanction loans were due, in the majority of cases, to insufficient security.

T. F. MAIN,
Deputy Director of Agriculture,
S. C. D., Poona.

APPENDIX E.

ANNUAL REPORT AND SUMMARY OF WORK DONE BY THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN DIVISION, FOR THE YEAR 1924-25.

Staff and Organisation.

1. I held charge of the office of the Deputy Director of Agriculture, Southern Division throughout the year and was out on tour for 280 days.

2. The organisation in sections each responsible through its head to the Deputy Director and reorganisation of the District staff brought about last year were maintained. The District staff did both propaganda and organisation work.

3. Mr. G. R. Deshpande was on leave throughout the year, Mr. H. B. Kulkarni who was on leave for 8 months returned to his duty on 1st October 1924. Mr. R. Y. Hulkoti, the Head Master Devi-hosur School was deputed to act as Inspector of Agricultural Schools from 13th June to 30th November 1924 during which period Mr. V. C. Pavate acted for him. Mr. M. A. Shetti, the seed organiser, who was on leave, I am sorry to express, died on 15th February 1925. He was a very senior organiser and his death has been a great loss to the movement of the Agricultural co-operation in the Southern Division. Mr. R. S. Patil continued to work in Mr. Shetti's place and Mr. R. K. Itagi in Mr. Patil's place.

Season.

4. The special features of the season were—good antimonsoon and monsoon showers but absence of late rains in October and November, continuous north-east winds from November to February, attack of grass-hoppers on jowar and rust on wheat, and outbreak of rinder-pest on cattle.

5. In Malhad the season for paddy crop was exceptionally good and harvests, were bumper. The outbreak of rinder-pest on cattle however was very severe and the cultivators lost much of their cattle wealth.

6. In Gadinad kharif jowar suffered from the attack of grass-hoppers when young, and long break afterwards. Wheat suffered from rust and cotton from continuous north-east winds. The yields of all these crops were below normal. The cultivators of Gadinad got just enough but could not make any saving. His cattle died from rinder-pest.

7. In Yerinad (dry tract) owing to good antimonsoon and early monsoon showers area under kharif jowar increased but the crop suffered from want of rains in October and gave poor yields of grain but sufficient quantity of fodder. The fate of cotton, wheat and Rabi jowar was also bad. The cultivator of Yerinad has been continuously suffering for the last 5—6 years but the year under report was better than the past.

8. The work done by various sections is summarised under the following heads :—

(1) Investigation and Experiments.

(2) Propaganda.

(3) Organisation.

(4) Agricultural Education and

(5) Miscellaneous.

Investigation and Experiments.

9. Investigation was mainly done on Government Farms Dharwar, Gokak, Mugad and Tegur, whereas experiments were conducted on Government Farms as well as in cultivators' fields.

10. *Dharwar Farm.*—Continued to rise in importance as a plant breeding station. In cotton, selection in the cross between Dharwar No. I X Rosea and the study of the cross between Dharwar No. I X Wagale for wilt resistance continued. The cross between Dharwar No. I X Rosea has yielded some valuable strains. The strain No. 1 (1-A-18-3-3-15) combines all the good characters required. It possesses long staple and good yielding capacity which are the characters of Dharwar No. I and has also high ginning and good white colour of the Rosea. Observations on comparative trials are encouraging. The strain is tested to be pure and is proposed to be multiplied during the coming season on Gokak Farm where there is no wilt. Two other strains are also promising but are under further study.

11. The cross between Dharwar No. I X Wagale reached F3 generation. The progeny of 64 plants was studied and the percentage of wilt varied from 0 to 41. Results as far as wilt resistance is concerned seem to be very promising in this cross but observations made on the combination of other economic characters are not in any way encouraging. Thirteen plants have been selected for further study.

12. Attempts were made to cross Indian and American cottons repeatedly for a few years past with failures but this year the cross has succeeded in two cases. (Dharwar No. I X Rosea cross with Gadag No. I and Sea Island). The seed obtained will be sown and carefully watched. If the bolls obtained are really crosses they may create interest in the cotton world.

13. A careful study was made on the shredding of cotton bolls and its relation with the bollworm. It was observed that in early stages the shedding was more due to bollworm but later more on account of other causes. A thorough investigation of all the causes of shedding seems to be necessary. Studies in correlations have been taken up and will be summarised when complete. Selfing and multiplication of the seed of Dharwar No. I and Gadag No. I cottons which have been so very popular in Dharwar District continued as usual.

14. *Jowar breeding work.*—Ten varieties—Chavari, Aralin, Nandyal, Muddinandyal, Mahisal, Holgi, Wagar, Fulgar white, Fulgar yellow and

Handimasadi were maintained pure by protecting the earheads with bags against cross fertilization. Purification and selection in Kanvi and Hasarbiga has been undertaken for Gadag tract. Savaner has been found to be the most desirable among the early varieties. Selection for high yield was done in Fulgar white, Fulgar yellow Nandyal and Bilichigan. The selected strains were compared on a large scale with ordinary seed and were found to be promising. Mahisal strain No. 20 gave 1,300 lbs. grain, 2,750 lbs. kadbi and 360 lbs. chaff per acre. Four selections of Muddinandyal are also promising. The characters associated with yield and earliness are being studied. The attack of grass-hoppers spoiled jowar breeding work to a certain extent. It was observed that Holgi, Fulgars, Chowari and Ambebahar suffered more than Vagar Muddinandyal and Nandyal varieties.

15. *Ground-nut breeding work.*—This is a new special work undertaken by the Cotton Breeder. The types referred to in paragraph 26 of the last year's report were grown separately. Out of 24 plants selected as good yielding, 10 proved to be distinctly high yielding and these have been retained for multiplication and further test. It was further observed that the number of pods on the plant does not influence the yield so much as the size does. Correlations between the yield and the average number of pods and between the yield and the size of pods seems to be worth studying but need the attention of a separate hand. Proposals will be submitted after some more study of the crop. The promising strains were 18 per cent. better than the unselected general seed. The results are encouraging but need confirmation.

16. The other experiments conducted by the Superintendent of Dharwar Farm were mainly on crops and manures.

17. *Crop Experiments.*—Four varieties of jowar, *viz.*, Nandyal, Fulgar white, Fulgar yellow and Mahisal were tried. Nandyal stood best both from the point of grain and kadbi. X Holgi variety of jowar tried again during the year did not give a ratoon crop. The trial of wheat varieties was vitiated by the attack of rust. Pusa varieties resisted the attack. The trial of Lucerne as a dry crop in lowlying black soil fields is on the whole encouraging. The trial of tobacco needs repetition. The Algaroba plants are making good progress.

18. *Manurial Experiments.*—The average results of Farm Yard Manure series for 4 years were tabulated in the last year's annual report. This year's results too go to confirm that an application of 10 tons every second year is the best method and that of 15 tons every second year is not economic. The heavy dressing of Crude night-soil in 1914-15 gave good results till last year but those of the year under report indicate that the manure is exhausted. Both yield and net profit are lower than those of the control plot. The results of ploughing the farm-yard manure either before or after cotton are not again this year encouraging. The experiments will complete three cycles next season, and will be summarised At the request of an American Firm made to the Director of Agriculture B. P. Poona, Amophos manure was tried on cotton in

comparison with Ammonium Sulphate and cake manure. All these were applied at the rate of 28 lbs. nitrogen per acre. The results are not in favour of this new manure. Results of bone meal on cotton are not also encouraging. With a view to find out whether green manuring can be adopted in the cultivation of dry crops like cotton, wheat and jowar in the transition tract, an experiment of san-green-manuring was laid out. Results will be published after a cycle of three years. The spacing experiment on cotton is in favour of 3′ between the rows over 2′ or 4′. The experiment will be repeated.

19. The Garden work on Dharwar Farm is being remodelled. Mango cultivation and nursery which seem to have large scope round Dharwar is receiving greater attention. Fig cultivation stands next to mango. A few " Gooti " grafts of Chikkoo and seedless guava are being prepared for sale.

20. *Gokak Farm.*—Manurial experiments on cane, maize, turmeric and fodder jowar are important. Results of Amophos manure against the standard top-dressing of ground-nut cake (150 lbs. N) are encouraging. Maize continued to respond to cake top-dressing (40 lbs. N). Results of the top-dressing turmeric crop with cake manure are in confirmation with those of previous years not favourable. Results of pig manure on maize, sugar-cane and fodder jowar are very striking. The cultivators round Gokak have soon understood the value of it and there is now keen demand for it. These three experiments need no repetition. Slaughter house refuse (5 tons per acre) was compared with Farm Yard manure (5 tons per acre) and the results are in favour of the former. Application of bone meal to cane crop in addition to other top-dressing manures has not paid its way. The farm has contributed much towards solution of the manurial problem in the Gokak Canal tract.

21. *Cultural experiments.*—There has been very little to choose between Gokak farm and modified Manjri method of growing cane during the year. The experiment will be continued for a year more and results of 6 years will be summarised. Slow furrow irrigation (improved Manjri system) has given decidedly better results than local system with less quantity of water. The experiment is very encouraging and will be repeated. The system of growing a mixed crop of maize and tur in rows has again given decidedly better results than taking two crops of maize one after another. The system is both in the interest of the cultivator and the fertility of the land and it is attracting the attention of the cultivators in the Canal tract. A mixed crop of Rala and cotton in rows 18″ apart has given a net profit of Rs. 143 against cotton alone which has yielded a net profit of Rs. 77 per acre. The experiment is very encouraging but needs confirmation. With a view to minimise the cost of turmeric seed which generally sells dear an experiment was conducted with cut versus whole sets. The sets were divided into two and 50 per cent. saving was effected. The yield of cured turmeric in the case of cut sets has been less but the net profits more than in the control plot. The experiment will be repeated.

22. *Crop experiments.*—In the trial of cane varieties, Khadya has stood best under the conditions of water supply during the year. A summary of several years' experience would be interesting.

(*a*) Khadya is a promising hard pig-proof variety resisting drought and is well suited to the conditions of Canal tract. Its adoption however means change in the Gural organisation.

(*b*) Yellow Mauritius is a semi-hard variety resisting drought and thriving well on kirl soils. It tillers less and gives lower yields than local pundia in good soils. It is a variety particularly suited to kirl soils which exist in canal tract.

(*c*) Red sports and Barbados are semi hard quick growing early varieties and give fairly good yields. They arrow and lodge however and produce inferior gul. The cultivators are not likely to take to them.

(*d*) Stripped Mauritius and Manjav need be rejected.

23. In the trial of cotton varieties Dharwar No. 5 stood first in point of yield giving 1,400 lbs. seed cotton per acre. Next to it was Dharwar No. I X Rosea cross which gave 1,352 lbs. In the trial of tobacco varieties, Sumatra stood first and local broad leaved second. In sweet potatoes, Ceylon white and American red have done better than local varieties. These foreign varieties are attracting the attention of the cultivators. Local red has again given the best yield of creepers.

The other crops which gave promising yields on Gokak farm were Lucerne and groundnut. Lucerne yielded 47,000 lbs. green fodder and groundnut 2,600 lbs. pods per acre.

24. *Garden.*—Santras bore a good Mriga Bahar crop fetching Rs. 450 for 20 gunthas. The garden did well on the whole and has yielded a net profit of Rs. 500. The nursery business is extending.

25. *Depôt*—Besides field experiments the farm depôt sold articles worth Rs. 4,500 during the year and continued its close touch with the cultivators in various ways. The articles sold were mainly implements, manure, seed, seedlings and grafts.

26. *Mugad Farm.*—The land was levelled and made fit for breeding work. To preserve seed and important selected strains a rat proof shed was erected at a cost of Rs. 1,000. As regards actual work, 254 samples of Antarsal and 318 of Mugad were studied in general. On 25 in each of these, an intensive study was made on the economic characters described in paragraph 40 of the last year's report. On the basis of yield of individual plant characters of 142 cultures from Antarsal and 188 from Mugad have again been selected this year for general study during the next season. Out of these, 25 from each have been selected and preserved for replication and 10 best out of those 25 for very intensive study. These 10 selections in each variety show very promising improvement over the check but need corroboration in successive years.

27. About 30 samples of Gonag obtained from cultivators' fields were sown. Some were found to be pure wild rices while others indicated splitting. The problem of Gonag is being studied further.

28. *Tegur Farm.*—The season under report of cattle of Tegur Farm was a good one. Many cattle died of rinderpest in the neighbourhood but the farm was kept free from contagion. 37,300 lbs. maize 10,000 lbs. grass silage 120,000 lbs. hay were prepared. Grazing and supply of drinking water were also adequate and the cattle thrived well. 8 bull calves were sold for Rs. 850 and the total number of cattle on 31st March 1925 was 127. The fact that cross bred animals of Tegur farm are fetching better prices than local ones, in the very mallad tract and elsewhere proves its popularity.

29. *Experiments in cultivators' fields.*—The District staff conducted a number of experiments with good results and demonstrated them to the cultivators. The important among them were :—

1. Bone meal and cake manure on paddy crop in 12 places. The use of these manures is extending.
2. Cake manure and Ammonium Sulphate on cane crop in 10 places. The use of these is becoming very popular.
3. Trial of groundnut (Spanish peanut variety) in 8 places. The area under this crop is fast increasing.
4. San green manuring in 6 places. The experiments were successful but the succeeding crop of wheat was attacked by rust.
5. The trial of turmeric in mallad under tank irrigation and in gadinad under well irrigation—in 6 places. The progress round Bailhongal is marked. Demand for seed increased and the seed had to be ordered from Satara District.

Propaganda.

30. *Demonstrations of improved implements.*—(Iron ploughs, Circular chaff cutter, Disc harrow, iron scraper, wheat thresher and stone roller.) This was the main propaganda work of the general district staff. A series of demonstrations were conducted in all quarters of the Division. Ploughing competitions were held in 4 places and prizes were awarded. The demonstrations of circular chaff cutters have been appreciated by the cultivators. The Dharwar District Agricultural Association sold during the year 17 circular chaff cutters. Wheat threshers with 12 discs have been popular and the Dharwar farm prepared and sold 5 such threshers during the year. The use of stone-roller is largely extending.

31. *Demonstrations of Nahan cane crushing mill, Poona furnace and gul-making.*—These in the mallad tract of the Belgaum District have been very popular and our propaganda has been a thorough success there. In the mallad of Dharwar District some more demonstrations are needed. In Chikkodi and Hukkeri talukas of the Belgaum District, the Poona furnace is attracting the attention of the cultivators but not the mill and the pan.

32. Other demonstrations were of crops experimented in cultivators' fields and wider method of planting cane in Chikkodi and Hukkeri Talukas.

33. *Propaganda against smut.*—In most of the demonstrations above referred to, steeping jowar seed against smut was also a regular item. Besides these, separate demonstrations were arranged in all taluka centres and in many places in the interior, at sowing time. This propaganda was mainly done through the Revenue Officers. The total number of packets distributed was 42,100. The Mamlatdars of Dharwar, Ranebennur, Gadag and Parasgad and the Mahalkari of Murgod worked better than others.

34. *General propaganda.*—This consisted in general advice to cultivators all over the division by the Deputy Director and his District staff by holding small homely meetings to which much importance was given during the year under report. The important subjects of advice were—items referred to in paragraph 41 fencing against pigs in mallad, cattle improvement, improvement in cane cultivation, extension of Dharwar No. I and Gadag No. I cottons in suitable areas and their co-operative sale the use and advantages of various improved implements and bunding on contour lines. Talks on rural economics were also frequent.

Organisation.

35. The District staff every now and then inspected the existing non-credit societies and Taluka Development Associations in their charge, did the needed propaganda for them in the neighbourhood and attempted to start new ones after preparing the ground required.

36. *Seed and implement societies.*—These are 34 in number. The business done by these societies in implements has not in any way been encouraging. This is mainly due to the fact that the prices of iron ploughs have considerably gone down and the cultivators are inclined to purchase rather than take them on hire. Only four societies (sulebhavi, Hosritti, Yalvagi and Amminbhavi) have done some fair work. All these 34 societies together own about 200 ploughs. The business done in seed has been better but by no means satisfactory. Six societies (Devihosur, Karjagi Gadga-Betigeri, Saswihalli, Panigatti and Muddebihal) have done fairly good work. The seed purchased and distributed by these societies in all was 2,500 bags. After doing all the needed propaganda for these societies I am definitely of opinion that small seed and implement societies cannot afford to maintain well paid secretaries to run their technical work and should better be amalgamated into one for each Taluka in a suitable centre. The Taluka Development Association where they exist should better take up this work to start with and should collect indents through credit societies.

37. *Manure societies.*—Kabbur and Bellad-Bagewadi societies distributed ammonium sulphate and cake manure. The District Agricultural Overseer Chikkodi took pains to revive them.

38. *Cotton Sale societies.*—Among all the non-credit agricultural societies these continued to serve the cultivators best. The total number of dokras sold by different societies in auction sales was 43,013 (Hubli

15,728, Gadag 21,286, Haveri 3,422, Dharwar 2,213, and Bijapur 364) Bailhongal and Annigeri societies disposed off their arrivals by private Treaty. The total number of dokras so sold by all the societies amounted to about 15,000. Prices realised in auction sales were far better than those in private treaty. Hubli and Gadag sale societies have now taken their root. Haveri, Dharwar and Annigeri should in my opinion serve as branches. Bijapur, Bagalkot and Bailhongal need further development as independent societies.

39. *Other sale societies.*—The Chilly sale society at Byadgi sold 209,760 lbs. produce worth Rs. 44,940 and realised a net profit of Rs. 921. The Hirekerur Taluka Development Association also worked for this society. The Nippani tobacco sale society sold 1,41,040 lbs. produce worth Rs. 67,328 up to 31st March 1925 and realised a net profit of Rs. 2,127. This society is not is not really a Producers' society and needs further development in that direction for which attempts are being made.

40. *Cattle Breeding societies.*—Two new societies—one at Haunsbhavi and other at Bhogavi—both in Hirekerur Taluka of the Dharwar District were organised and registered under the co-operative act. Some old societies have considerably improved. Sidenur Cattle Breeding society has increased the number of cows to 110 and is erecting a cattle shed outside the village. The total number of cattle breeding societies is now 13.

41. *Fencing societies.*—Dhumwad, Kurankop, Birawalli, Bendalgatti and Astagatti fencing societies have realised the benefits of their walls against wild pig. Their watching expenses have been saved and new waste land is coming under cultivation. The rental value of the land is also increasing. Three new societies Nelliharve, Bommigatti and Tavergeri have been formed and registered under the co-operative act and the building work is in progress. The Tadas scheme is almost ready for registration. The schemes at Tegur, Kittur, Bidi and Arbhavi met difficulties and have not yet matured. The one at Arbhavi will come out soon.

42. The campaign of the removal of the prickly-pear against pig in Mundargi petha with the help of the Deputy Collector III Dn. Dharwar continued during the year. The work is in progress in 9 villages, and the prickly-pear both in Government waste land and in cultivators' fields is being removed. A special Kamagar has been deputed to this work under the District Agricultural Overseer, Gadag. The relief from the ravages of pig has been substantial and the work has been much appreciated by the cultivators.

43. *Joint cultivation and Irrigation Societies.*—Maharajpeth joint cultivation society was registered under the co-operative act. The Mango joint cultivation at Amminbhavi was damaged by some people under private grudge and investigation is being made by the police. The importance of joint cultivation and irrigation schemes have been dealt with in para. 57 of the last year's annual report. Good many schemes are being worked out and some will mature during the coming season.

44. *Taluka Development Associations.*—Two new such Associations Hirekerur and Hangal were organised and registered under the co-operative act during the year. There are now in all 9 Taluka Development Associations in the Southern Division. Athani Association did good work in connection with fodderstorage against famine. Fodder worth Rs. 8,000 and subscription amounting to Rs. 7,000 have been collected, under the directions of Mr. Hiremath, the Deputy Collector II Division and a subsidy of Rs. 15,000 was given by Government for purchase of fodder. Stacks have been built under the supervision of Mr. Neginhal, the District Agricultural Overseer in charge of that Division. Chikkodi Taluka Development Association purchased a boring machine. All Taluka Development Associations except Ron did propaganda work in various directions but Indi, Chikkodi, Gadag and Dharwar Associations did more work than others. Hirekerur and Hangal Taluka Development Associations have good collections and their activities were manifold. Regular programmes of work were drawn for all these Associations by the Deputy Director in consultation with the District staff and the associations concerned. These associations have great future but the question of collecting local subscriptions has been very difficult and needs solution. A sort of levy on the agriculturists in good years which will bring in a capital that will yield an interest of Rs. 1,000 every year is what is really needed and a move is necessary in that direction. Six new associations (Hukkeri, Savadatti, Haveri, Navalgund, Bijapur and Sindagi) are being organised and it is hoped that Navalgund, Bijapur and Saundatti Associations will soon come into existence.

45. *The District Agricultural Association, Dharwar.*—Sold implements worth Rs. 3,914, realised Rs. 174 as hire proceeds on iron ploughs and arranged a Mango show during the year. The Committee which was appointed to consider the question of relation between this and co-operative bodies met twice and drafted a report which has been submitted to the Director of Agriculture and the Registrar, Co-operative Societies, for consideration.

46. *District Cotton work.*—The Cotton staff as usual distributed farm seed Dharwar No. I at Sherewad over an area of 758 acres and Gadag No. I at Gadag and Kurtakoti over an area of 370 acres. The seed raised on seed growers' farms were distributed Dharwar No. I in 5,000 and Gadag No. I in 6,200 acre blocks. Sowing and rouging operations were attended to and the produce raised was brought to the auction sales (Dharwar No. I to Hubli and Gadag No. I to Gadag) ginned separately and seed stocked for further distribution. Quantities available for next season are, Dharwar No. I seed 1,060,500 lbs. sufficient for 106,046 acres and Gadag No. I seed 952,300 lbs. sufficient for 95,230 acres. The District staff and the Cotton sale societies, Hubli, Gadag and Bijapur worked together for general distribution of the seed stocked last year. The distribution was done through seed societies and by opening independent depôts in respective areas. Dharwar No. I general seed of known origin had spread over an area 90,000 acres and Gadag No. I over 95,000 acres. Besides this merchants and Dalals distributed a lot. At the time of this propaganda of seed distribution, steeping seed in salt solution, sowing

with Surat drill clean picking and sale of the produce through co-operative sale societies were advocated. During the year under report 43,013 dokras of different types of cotton were graded and sold by auction by cultivators through sale societies 30 per cent. of the produce of the seed distributed came to sale societies and realised an extra profit of Rs. 3,30,000. The rest went to the markets.

47. The co-operative seed and sale organisation is not keeping place with the spread of these varieties. Adequate and more timely finance to the cotton grower described in para. 62 of the last year's annual report is yet a problem and needs solution by the Registrar, C. S., B. P., Poona. Cotton work is largely extending in the Southern Division and the appointment of a Cotton Overseer at Bijapur is an immediate need.

48. The Cotton Transport Act has worked very satisfactorily in the Southern Division. There were some difficulties regarding the import of cotton from adjoining parts outside the limits into Gadag and Bijapur markets, and the Director of Agriculture who is a licensing Officer settled them by his personal visits. Licenses were freely issued at Gadag for import of cotton from the adjoining parts of Nizam's dominions and Madras Presidency. This was an additional heavy work to the Cotton Overseer and very responsible work too; but it was essential.

49. The Mechanical Assistant inspected 6 pumping sites in Bijapur District, 4 in Belgaum District and 2 in Dharwar District and prepared drawings and estimates. He turned one hand circular chaffcutter into power at Bijapur, assisted in erecting a Rice hulling machine at Kittur and repaired the pumping plant at Neginhal. He attended to all the machinery over the farms in this Division, overhauled oil engine, centrifugal pump, cane crusher, chaffcutter and counter shaft on Arbhavi farm and oil engine on Dharwar Farm, erected weigh-bridge chaffcutter and corn crusher on Bankapur farm. He had full work during the year.

50. *Embankments.*—The special bunding officer prepared 21 new schemes during the year, out of which 11 schemes are within the radius of 10 miles from Gadag. The schemes prepared last year were executed. Efforts are being made to concentrate the work in certain areas. A co-operative bunding scheme at Sirur is being attempted. Individual schemes extending over an area of about 200 acres in five villages are also under contemplation. Bunding on contour lines is attracting the attention of the cultivators and applications from all quarters cannot be attended to. It is necessary that all District Agricultural Overseers should develop this line of work and should possess levelling instruments.

Paragraph 51.—Boring work :—Five Machines continued to work, two in Dharwar, two in Belgaum and one in Bijapur District. The Machines in Dharwar District did very satisfactory work. Those in Belgaum worked only a part of the season as one was sent to Poona for being converted into a power machine and the engine of the other for repairs. The Bijapur machine did good amount of work but with less success. In all 42 bores were taken during the year the details of which are tabulated in a separate statement attached to the report. Of these 42 bores, 18 were

for agricultural purposes while the rest were for drinking. The working of different machines and their financial success is tabulated below.

District.	No. of Machine.	Number of bores taken.					No. of days worked.
		Successful.	Failure.	Incomplete.	Rejected	Total.	
Dharwar ..	10	10	..	..	..	10	148
Do. ..	12	8	..	1	2	11	212½
Do. ..	22*	3	1	..	..	4	84
Belgaum ..	22	3	..	..	..	3	
Do. ..	7	3	2	1	1	7	116
Bijapur ..	23	1	5	1	..	7	256
Total ..	5	28	8	3	3	42	816

District.	Depth bored.	Expenditure.	Receipts.	Profit or loss.
		Rs. a. p.	Rs. a. p.	Rs. a. p.†
Dharwar ..	651′ 6″	824 13 6	1,203 4 6	378 14 0†
Do. ..	652′ 5″	841 8 6	1,378 6 0	536 13 6
Do. ..	415′ 6″	1,085 2 0	1,025 13 4	59 4 8
Belgaum ..				
Do. ..	282′ 0″	1,321 8 3	624 1 0	697 7 3
Bijapur ..	498′ 6″	650 12 0	679 14 8	29 2 8
Total ..	2,499′ 11″	4,723 12 3	4,911 14 6	188 2 3

* After completing 4 bores in Dharwar District, the Machine was sent to Poona for conversion. It was worked in Belgaum District after its receipt from Poona.

† In addition to the profit of Rs. 188-2-3 miscellaneous receipts for repairing pumps were Rs. 136-1-0 making a total net profit of Rs. 324-3-3 for the year.

Paragraph 52.—Help given to Public Bodies in boring :—Two Departmental hands have been lent, one to Dharwar and the other to Chikkodi Taluka Development Associations. The boring work of these Associations, Gadag Taluka Local Board, Sangli State at Shirahatti and Bijapur District Local Board were occasionaly inspected on request and necessary advice given. The new plant ordered by the Hubli Municipality was inspected and was p'aced in charge of a local man trained on Departmental Machine. The Local Boards are not freely responding to the call of the people and the number of the Departmental Machines is quite insufficient to meet the demand.

53. *Karjagi Fodder Baling Plant.*—The kadbi shredding and baling plant erected close to the Karjagi Station as a measure against fodder famine was worked for the first time during the year under report. The season for jowar in the tract round Karjagi was only fair and free purchases of fodder were not possible. The Machine was worked on hire system for a time and then purchases worth Rs. 4,000 were made. 1,21,770 lbs. of kadbi was worked on hire system and 4,23,418 lbs. was purchased. The hire proceeds were 20,340 lbs. In all therefore 4,43,758 lbs. of kadbi (5,282) bales has been stocked in the godown built near the plant. The cost of kadbi including cartage to the plant came to 0-11-6 per 100 lbs. and the cost of baling is being worked out by the Agricultural Engineer. The machine being new had many break-downs during the year.

Agricultural Education.

54. The Agricultural School at Devihosur completed its 11th year and during this whole period 112 students have passed out. As many as 62 applications were received during the year for admission and this tells the popularity of the school. 18 students were selected but 4 were sent back as unfit. 14 students in the 1st year and 12 students in the 2nd year received education during the year. Besides 4 teachers for agricultural bias schools and one kamagar for Konkan were trained to do their duties. All these were occasionally taken on tour to study various subjects which could not properly be studied at Devihosur. The school is now very popular.

55. Two agricultural bias schools were opened. One at Bhatgunki in Indi Taluka of the Bijapur District and the other at Hulkoti in the Gadag Taluka of the Dharwar District and the teachers trained in 1923-24 were sent to these schools. Hulkoti school has been more successful than Bhatgunki.

Miscellanious work.

56. The Divisional Board held its quarterly meeting very regularly and all the members official and non-official were regular in their attendance. Good many important subjects were discussed in these meetings and the proceedings were submitted to the Joint Board. The Deputy Director of Agriculture, S. D. was the Chairman of the Board throughout the year. The Officers' Divisional Conference was held in the month of May 1925 when subjects concerning investigation, experiments, propaganda and organisation were freely discussed and programme of important work outlined.

57. Co-operative conference at Belgalpeth, Hiremallur. Haveri, Bailhongal and Shelwadi were attended and subjects on agricultural co-operation discussed.

58. Tagavi loan applications for amounts exceeding Rs. 1,000 amounting to in all Rs. 1,08,550 for land improvement were dealt with. Various sites were inspected and estimates of schemes prepared.

59. 1,300 Mango grafts were distributed round Dharwar through Rao Saheb M. L. Kulkarni, retired Deputy Director of Agriculture.

General Remarks.

60. Improvements and organisation in agriculture are awakening the people and their demand for advice and help on the Deputy Director and his staff has considerably increased.

61. My office is now required to work direct with 20 heads of sections with varied activities, 9 Taluka Development Associations and 66 Non-credit societies, besides Revenue Officers and individuals. The work of Divisional Board has largely increased and that of checking and counter-signing the Travelling Allowance Bills was newly added during the year. My office work is going out of control, and I cannot but reiterate that an additional clerk is an immediate bad need.

62. The staff in general has put in good year's work. The work of the Cotton Overseers Gadag and Hubli and that of Embankment officer deserve special mention. Mr. Brahme with the limited staff under him ably conducted my office and did his best to cope with the work which has so vastly increased.

63. Many Revenue officers and private gentlemen continued to help our demonstrations and organisation work. To the list of the persons that I have mentioned in para. 81 of the last annual report, I must add this year the names of Mr. Revanshiddappa Hipparagi, President, Taluka Development Association, Athani and Mr. S. S. Alur, Secretary, Taluka Development Association, Chikkodi who showed an amount of interest in their work.

64. In conclusion I am glad to make a mention that His Excellency the Right Honourable Sir Leslie Orme Wilson, P.C.G.,C.I.E.,C.M.G.,D.S.O, visited Dharwar Farm on 26th August 1924 and spent an hour and half in inspecting the work of the Division arranged in different sections. His Excellency also interviewed the members of the District Agricultural Association there. His visit was a very encouraging one.

S. S. SALIMATH,
Deputy Director of Agriculture,
S. D., Dharwar.

Statement showing the details of

Serial No.	Name of owner.	Name of Taluka.	Name of Village.	Diameter of Bore.	Depth of Boring.	Water before boring in gallons per hour.
	Dharwar District.			Inches.		
1	Mr. Tippanna Chitragar ..	Savanur ..	Savanur ..	3″	65′—0″	..
2	,, Phay Ahamadkhan Pathan	,, ..	,, ..	3″	76′—0″	360
3	State work	,, ..	,, ..	3″	60′—0″	..
4	Gousumiya Husenmiya ..	,, ..	,, ..	3″	95′—0″	160
5	Buddekhansaheb ..	,, ..	,, ..	3″	70′—0″	200
6	Mostansaheb	,, ..	,, ..	3″	44′—0″	200
7	Parakhmiya	,, ..	,, ..	3″	75′—0″	160
8	Modinsab	,, ..	,, ..	3″	72′—0″	160
9	,, ...	,, ..	,, ..	3″	44′—0″	360
10	Dongariba	,, ..	,, ..	3″	41′—6″	100
11	Chairman, Municipality ..	Kundagol ..	Kundagol ..	3″	28′—0″	100
12	,, ..	,, ..	,, ..	3″	20′—0″	100
13	,, ..	,, ..	,, ..	3″	50′—0″	..
14	Mr. R. K. Nadgur ..	,, ..	,, ..	3″	160′—0″	..
15	,, V. M. Deshpande ..	,, ..	,, ..	3″	160′—0″	..
16	,, Tejappa Hubli ..	Hubli ..	Hubli ..	3″	100′—0″	200
17	,, N. S. Chitgubbi ..	,,	,, ..	3″	72′—0″	100
18	,, ,, ..	,, ..	,, ..	3″	82′—0″	200
19	,, Krishtapa Naik ..	Gadag ..	Mulgund ..	3″	20′—0″	..
20	,, Govind Ramchandra ..	,, ..	,, ..	3″	41′—6″	..
21	,, Rangappa Naik ..	,,	,, ..	3″	22′—5″	40
22	,, Ramachandrapa Kulkarni ..	,, ..	,, ..	3″	17′—6″	200
23	,, Gangadhar Ganesh ..	,, ..	,, ..	3″	40′—0″	..
24	,, Mailargowda Patil ..	,, ..	Kurtakoti ..	3″	95′—0″	..
25	,, ,, ..	,, ..	,, ..	3″	2′—0″	..
	Belgaum District.					
26	Mr. Irapa Ramapa ..	Chikodi ..	Akol ..	4″	5′—0″	..
27	,, Mahars	,, ..	,, ..	4″	46′—0″	..
28	,, Magadum	,, ..	,, ..	4″	19′—0″	..
29	,, D. P. Kulkarni ..	,, ..	,, ..	4″	55′—0″	..
30	,, Bala Kamate ..	,, ..	,, ..	4″	73′—0″	..
31	,, M. Patil	,, ..	,, ..	4″	33′—6″	..
32	,, Bhaichand Gujar ..	,, ..	,, ..	4″	50′—6″	..
33	Sardar V. G. Desai ..	Bail-Hongal	Chachdi ..	4″	21′—0″	100
34	,, ..	,, ..	,, ..	4″	52′—0″	100
35	,, ..	,, ..	,, ..	4″	84′—6″	100

bores taken during the year 1924 25.

Water after boring in gallons per hour.	Departmental charges.	Labour charges.	Coal and fuel for engine.	Total cost of Boring.	Cost per foot.	Result.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
560	121 4 0	112 8 0	10 0 0	243 12 0	3 12 0	Successful.
1,500	146 0 0	129 6 0	11 8 0	286 14 0	3 12 5	,,
240	110 0 0	151 14 0	13 8 0	275 6 0	4 9 5	,,
2,000	194 4 0	73 2 0	6 8 0	273 14 0	2 14 0	,,
2,000	155 8 0	90 0 0	8 0 0	253 8 0	3 3 4	,,
3,000	79 12 0	69 8 6	5 8 0	154 12 0	3 8 3	,,
1,800	148 3 6	69 7 6	6 0 0	223 10 0	2 15 8	,,
2,000	141 2 0	115 6 0	8 8 0	265 0 0	3 10 11	,,
1,500	77 0 0	45 0 0	4 0 0	126 0 0	2 13 10	,,
2,500	72 10 0	112 8 0	10 0 0	195 2 0	4 10 1	,,
400	96 8 0	48 2 0	4 2 0	148 12 0	2 12 1	Successful. Completed this year. Work done last 26'.
400	35 0 0	21 14 0	1 14 0	58 12 0	2 15 0	,, ,, ,,
..	50 0 0	30 10 0	2 10 0	83 4 0	1 10 8	Failure.
200	428 5 4	87 8 0	7 8 0	523 5 4	3 4 4	Successful.
200	426 0 0	87 8 0	7 8 0	521 0 0	3 4 1	,,
..	211 6 0	55 0 0	4 2 0	270 8 0	2 11 3	,,
600	144 14 0	55 0 0	4 2 0	203 0 0	2 13 1	,,
1,500	169 0 0	60 0 0	4 8 0	234 1 0	2 13 8	,,
..	20 0 0	120 0 0	40 0 0	180 0 0	9 0 0	Rejected.
..	41 8 0	275 10 0	90 0 0	407 2 0	9 13 0	,,
300	39 4 0	83 2 0	28 8 0	150 14 0	6 11 4	Successful.
1,000	30 10 0	39 6 0	13 8 0	83 8 0	4 12 6	,,
1,200	70 0 0	70 0 0	24 0 0	164 0 0	4 1 7	,,
260	225 3 0	65 10 0	8 0 0	298 13 0	3 2 4	,,
..	....	....	....	....	....	On hand.
..	75 0 0	60 0 0	64 0 0	199 0 0	3 15 8	Failure. Completed this year. Previous work done 45'.
260	103 8 0	35 0 0	44 0 0	182 8 0	3 15 6	Successful.
..	28 8 0	32 8 0	40 10 0	101 10 0	5 5 7	Rejected.
260	166 5 0	37 8 0	57 4 0	261 1 0	4 11 11	Successful.
260	175 12 0	52 8 0	65 10 0	293 14 0	4 0 5	,,
..	75 0 0	42 8 0	43 2 0	160 10 0	4 12 9	Failure.
..	....	....	....	....	....	On hand.
600	57 9 0	29 8 0	36 4 0	124 5 0	5 14 9	Successful.
400	128 5 0	53 0 0	83 6 0	264 11 0	5 1 5	,,
900	230 2 0	74 8 0	137 12 0	442 6 0	5 3 10	,,

Serial No.	Name of owner.	Name of Taluka.	Name of Village.	Diameter of Bore.	Depth of Boring.	Water before boring in gallons per hour.
	Bijapur District.			Inches.		
36	Messrs. Patil Brothers ..	Bijapur ..	Bijapur ..	3″	2′—0″	..
37	,, Harvey Sabhapati and Company	,, ..	,, ..	3″	50′—0″	100
38	Mr. R. B. Kembhavi ..	,, ..	,, ..	3″	50′—0″	..
39	Messrs. New Bearer and Company	,, ..	,, ..	3″	150′—0″	..
40	Merchant Ginning Pressing Company.	,, ..	,, ..	3″	100′—0″	..
41	Laxmi Oil Mill	,, ..	,, ..	3″	100′—0″	..
42	Messrs. Harvey Sabhapati and Company	,, ..	,, ..	3″	46′—6″	..

Water after boring in gallons per hour.	Departmental charges.			Labour charges.			Coal and fuel for engine.			Total cost of Boring.			Cost per foot.			Result.
	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	
200	112	8	0	105	0	0	15	12	0	233	4	0	3	5	3	Failure. Completed this year. Previous work 68'.
400	94	6	0	145	0	0	21	12	0	261	2	0	5	3	7	Successful.
100	50	0	0	115	0	0	17	4	0	182	4	0	3	10	4	Failure.
40	198	0	8	400	0	0	60	0	0	658	0	8	4	6	2	,,
40	112	8	0	270	0	0	40	8	0	423	0	0	4	3	8	,,
..	112	8	0	200	0	0	43	8	0	446	0	0	4	7	4	,,
..	..			..			..			..			..			On hand.

....,
Boring Assistant,
S. D., Dharwar.

APPENDIX F.

Summary of work done by the Deputy Director of Agriculture, Gujarat, Surat, for the year 1924-25.

I. Staff.

I was in charge of the Division throughout the year.

2. Mr. C. S. Patel was on deputation to Nasik Division as Deputy Director of Agriculture in place of Mr. Jenkins on leave for 8 months, from 12-5-1924 to 11-1-1925 and then he was on leave for 4 months. Mr. K. D. Naik acted in his place throughout the whole period.

II. Experimental and Research Work.

(1) *Cotton Breeding at Surat and Broach.*

3. The *crosses* between I A Cylindrical Boll type (Female) and Goghari E5 (Male) and 1027 (Female) and Goghari E5 (Male) have now reached the fifth generation, and some of them show good promising signs.

(2) *Jowar Breeding at Surat and Broach.*

4. *Surat.*—Out of the five old Budh Perio strains tried, Althan Deshi 6 and Mohani Timberva 7 have proved superior both in yield and quality of grain, the former having plump and glossy seeds and the latter having flat and bigger ones. When tried on a field scale on the Surat Farm the former yielded 876 lbs. and the latter 1,125 lbs. of grain per acre against 756 lbs. of other types. Out of 61 new selections from local samples of three main varieties, 29 have been retained, of which 6 are more promising and will be further tested. Natural cross fertilization between adjacent rows of Jowar occurs upto 25 per cent.

5. *Broach.*—Out of 14 strains of Rabi Jowar 9 have been maintained, of which Nos. 5, 8, and 12 (which are being purified) are more promising and are on average 33 per cent. superior to the local mixtures of 6 sample grown on the Broach Farm. Important botanical and economical characters are also studied at both the places.

(3) *Cotton Breeding at Viramgam.*

6. During the year under report, out of the 5 strains of Wagad isolated at Broach and transferred to Viramgam for further trial, the white flowered Wagad which did not show any superiority over the local ones during the last two seasons' trials at Viramgam was dropped, and only 4 strains Nos. 14, 8, 12, and 4 were tried on a field scale in comparison with

local Mandal which is considered to be best variety among the local Wagad Cotton. Outturn results are summarized below :—

Plot No.	Strain.	Area in Gunthas.	Yield per acre in lbs.	Ginning percentage.	Length of staple in C. ms.
1 and 8 ..	Local Mandal ..	10	554	36·25	1·88
3 ..	Wagad Pt. 14 ..	20	968	39·5	1·93
4 ..	,, Pt. 12 ..	20	950	41·0	1·93
6 ..	,, Pt. 4 ..	20	628	39·5	2·07
7 ..	,, Pt. 8 ..	14½	436	42·0	1·99

All the strains bred true to the character as observed in previous years. Plants 4 and 8 have gone down in yield due to poor soils towards the east in their respective plots, and some 30 to 50 per cent. of the plants withered due to want of moisture without giving any yield. All these 4 strains are decidedly superior to any of the local variety of Wagad cottons. Every effort is made for further multiplication of their seeds. If every thing goes right, the Department will be able to secure seed from the produce of 150 acres covered by the seed of these four strains from the seed growers.

(4) *Tobacco Breeding at Nadiad.*

7. As observed in the last year's report (pages 85 and 86), selfed seed of only 12 promising strains out of 32 of the last year was planted in two sections (*a*) for the study of economic characters and the comparison of the yield among themselves, and (*b*) for propagating the selfed seed of the best plant after selection and for study of the flower characters.

8. One segregate from each of the 4 local varieties was tested for yield against its local. Selfed seed of a single plant was used in each case. Pusa 28 was also grown along with for comparison. As a result the yield of each individual strain was superior to its corresponding local from which the original selection was made. The quality of each of them was also superior than the local as judged by the local market.

9. Greatly encouraged with the results so far obtained, it has been decided to segregate pure strains of Tobaccos grown in other parts of Gujarat for improving their local varieties. In tobacco the difference in prices due to quality is almost as great as that in cottons. Therefore the primary object of this Station is to find out high yielding strains having good qualities also, suitable for the local market, and if possible for the foreign market also.

10. The study of manures has been taken up this year and a series of experiments with castor cakes, sodium nitrate and Sann as green manure, etc., has been laid out, but it is too early to draw any conclusions this year. The question of curing tobacco has been postponed for the present to be tackled at some future date.

(5) *Surat Agricultural Station.*

11. (1) *Cotton.*—The whole of the Farm area of 56 acres and 38 gunthas to be sown with cotton was sown with the selected strain of 1027 A.L.F. The average yield of cotton on the Farm was 604 lbs. as against 350 lbs. in the surrounding villages of the Athwa Group, and against 469 lbs. per acre of last year. Nearly 20,000 lbs. of pure seed was obtained by ginning on the Farm the whole produce of the Farm cotton for distribution in Athwa group villages. (2) *Jowar :*—The total area under this crop was 67 acres and 3¼ gunthas, whose average yield came to 743 lbs. per acre as against 972 lbs. per acre of the last year.

12. *Ridging Experiments—Experiment No. 1.*—The original old experiment was still continued to see the after effect of manure, etc. The yield is still higher as compared with the average yield of the Farm.

Ridge Experiment No. 2.—As reported in the last year's report the same experiment was continued with a fresh doze of manure, as it had already finished one cycle.

The cotton results are in favour of ridging with shallow intertillage in furrows by 9·5 per cent. and ridging with deep intertillage in furrows by 26 per cent. over that sown on the flat. In the case ridged and manured plots an increase of 44 per cent. was effected, the manure given being 10 tons of F.Y.M. all given in trenches. In case of Jowar the yield over the flat sown plots was more by 18 per cent. to 34 per cent. grain by simple ridging and shallow intertillage and ridging with deep intertillage in the furrow. In case of ridged and manured plots the increase in grain and fodder both ranged from 60 to 64 per cent. over the flat.

Experiment No. 3.—This was started in the year 1923-24, with an addition of castor cake manure given as top-dressing to cotton and jowar both. The same process was continued except that the application of the castor cake was made to both the crops, whilst F.Y.M. was applied in 1923-24, as it is to be given every second year. The yield of cotton when castor cake is given in combination with F.Y.M. is more by 55 per cent. over the flat plot, while in the case of F.Y.M. alone it is only 31 per cent. over the flat. Castor cake in case of jowar has yielded 28 per cent. more grain and 69 per cent. more fodder, when applied alone than the flat unmanured plot, while there is an increase of jowar grain and fodder by 48 per cent. and 51 per cent. respectively, due to the residual effect of 10 tons of F.Y.M. applied in trenches to the previous crop of cotton, and in the case of F.Y.M. and castor cake combined it gave an increase of 62 per cent. in grain and 78 per cent. in fodder.

13. The ridge cultivation is spreading quickly in the surrounding villages. The total area sown by them during the year was 712 acres as against 285 acres of the last year. In two years the Department purchased ridging implements worth Rs. 1,400 and the surrounding cultivators purchased them of the total value of Rs. 5,970. All the sets purchased by the Department and all the available trained staff of the Surat Farm were placed at the disposal of the cultivators, for

preparing ridges and showing them their methods. The total number of ridging sets including those of the Department now available for the work in the district are 52 Middle Busters and Middle Breakers; 53 Cultivators and 7 Disc-harrows. From the above it is plain that the cultivators are adopting this method with earnestness.

14. The trials with Case Tractor were made during the hot weather with the set of implements newly purchased for the purpose. The black soil of the Surat district is exceptionally hard at this time of the year. We have however succeeded to tackle this kind of soil with a heavy mould board plough with certain new adjustments for penetrating the soil upto a depth of 10" to 12". But even then there remains a great problem of how best to crush the big clods turned over by the plough immediately after ploughing. This will have to be worked up in the next fair season along with detailed data as to the cost of working the tractor at different seasons of the year.

15. *Breeding Herd.*—The strength of the herd on 1st April 1925 was 130 against 108 of the last year. The total milk yield was 82,234 lbs. 12 ozs. of 38 cows against 76,257 lbs. and 12 ozs. of last year of 32 cows. After deducting newly calved and old animals the average yield per cow comes to 2,542 lbs. against 2,618 lbs. of the last year. The main feature of the year under report was that only 2 per cent. of the milk produced was put into the Separator, all the rest being sold as whole milk. As regards the performance of the animals, out of the 6 families maintained in this Dairy, the Gopi cow family has shown a good advance over the others. Majority of the cows in this family has yielded more than 3,000 lbs. a year. The total deaths during the year were 4 against 5 of the last year. There was no serious outbreak of any contagious disease except that of foot and mouth but without any casualty. During the year 4 bulls were issued to cultivators of Surat and Broach on premium system.

A new oil engine has been installed for the Dairy, and it is hoped that by its help enough green fodder will be raised for keeping up the milk supply and healthy condition of the herd.

(6) *Broach Farm.*

16. A greater part of the area of this farm was leased out temporarily as it was only required for multiplying the seed of the type suitable for the Broach tract that was evolved and supplied by the Breeding Branch.

(7) *Dohad Farm.*

17. The selection work in maize, wheat and gram was continued. In maize mass selection has done better. Multiplication and distribution of promising selected strains is being pushed on. Pusa 4 has maintained its superiority in point of yield nearly 200 lbs. more per acre, and is grown by cultivators on a large scale.

18. *Cultural Experiments.*—The main object of the Station is to introduce better crops and practices and raise the standard of cultivation

of the Bhils rather than to do much experimental work. Wider planting of maize 2′ apart as against the local practice of sowing 15″ to 18″ has given an average increase of 25 per cent. yield over the local method. Wider planting of wheat also has shown better results. But further trials are necessary to confirm the results so far obtained.

19. *Varietal Experiments.*—N. R. Cotton has passed its experimental stage on the Farm. It is spreading both in Dohad and Jhalod. The cultivation of variali (Fennel seed) has proved to be profitable after four or five years' trials and a trial will be made to introduce it in the tract wherever irrigation facilities exist.

(8) *Amalsad Farm.*

20. No appearance of Red-rot was either observed in any of the canes on the Farm nor in the vicinity. Out of the 6 promising varieties tried on the Farm, Red-Sports, Manjav and Stripped Mauritius have kept up their reputation in point of yield and other factors too. All the available seed of these three varieties to the extent of 12, 22, 710 sets was distributed in the surrounding tract at a premium price of Rs. 5 over the local rate of 1,000 sets. Of all these, Red-Sports is not only superior in yield, *viz.*, 80,566 lbs. cane per acre, but is much superior in percentage of juice to cane and the sugar contents to juice. It was impossible to meet the demand of seed of this variety as it is also hardy and does not require so much water as the Malbari or other soft varieties.

21. *New Crops.*—Three new crops, *viz.*, (1) Pan (Betel leaves), (2) Parwar and (3) Plantain varieties were tried on the Farm. Of these three (1) Pan does not seem to have done so well as the other two. Some of the creepers died out but those that exist are in good condition, from which I am led to believe that the knowledge of cultivation seems to be wanting in the Overseer or that the soil has proved to be too heavy for it. (2) Parwar is a very valuable and rare vegetable in Gujarat and fetches at least annas 4 per lb. when cheapest; or 8 to 12 annas per lb. when scarce in the Bazar. (3) Plantain varieties—about 20 new varieties—from Poona and Bassein have been imported and planted and they are all doing well, but no conclusions can be deduced before they begin bearing. In addition to the distribution of the Sugarcane sets and Parwar sets worth nearly a thousand rupees, the Farm has supplied seeds to others worth Rs. 3,000.

III. Agricultural Education.

22. There are two Vernacular Agricultural Schools in this Division, one at Godhra started in the year 1920 and the other at Surat opened temporarily in the year 1923. From the satisfactory work shown by the Surat Vernacular Agricultural School, the Government has been pleased to make it permanent from 1925. The classes started with 31 boys at Godhra and 30 boys at Surat. Four of the latter left the school due to unavoidable circumstances.

23. The results of the annual examinations of the schools held in April 1925 were as under :—

Number of boys.	Godhra		Surat	
	Appeared.	Passed.	Appeared.	Passed.
1st year	14	13	13	13
2nd year	16	13	13	11
	30	26	26	24.

24. The total expenditure of the Godhra and Surat schools during the year was Rs. 8,562-1-0 and Rs. 8,756-15-0 respectively. The District Local Board, Panch Mahals and Surat contributed Rs. 300 and 1,700 respectively toward the expenditure. The total Receipts of the schools amounted to Rs. 426-1-3 and Rs. 221-15-7 respectively, excluding from the latter Rs. 300 received from the Sachin State for the expense of a Scholar from that State for the last two years. The average feeding charges per boy per month cost to Government were Rs. 6-10-0 and Rs. 9-12-0 at Godhra and Surat respectively.

(2) *Agricultural Education imparted by the Staff of the Agricultural Department to the students of the Primary Schools.*

25. This was continued as last year in the case of the Dharala Boarding School adjoining the Godhra Vernacular Agricultural School and the Bhil Central School near the Dohad Farm. At the Annual examination the number of boys passed was 5 and 5 out of 6 and 5 at Godhra and 5 and 6 out of 5 and 8 at Dohad in the 1st and 2nd years respectively.

(3) *Training of the Primary School Teachers for the introduction of the Agricultural Bias Course in Rural Schools.*

26. The second batch of 5 teachers taken up for special agricultural training at the Godhra Vernacular Agricultural School in June 1924 finished their course successfully and joined the 5 rural schools one in each of the 5 Districts.

(4) *Publication of Agricultural matters.*

27. The publication of the Broach Quarterly Magazine was continued as usual, 20 articles in all being supplied by the Agricultural staff in this Division, and also material is being supplied to the Publishing Committee for publishing articles on agricultural matters in the Public Press.

IV. Propaganda Work.

28. *Divisional Board.*—The Divisional Board of Agriculture, Gujarat, held four meetings during the year. In addition, the Gujarat Divisional Cotton Committee attached to the Board held its special meeting on 11th and 18th February 1925. Both the bodies worked satisfactorily.

29. *District Cotton work.* (1) The total area under the control of the Department was 11,557 acres 4 gunthas against 9,146 acres 6 gunthas of the last year, the whole area being under 1027 A.L.F. In all five Gins at Surat, Bardoli, Navsari and Sisodra were selected for ginning the produce of the controlled area with the help of the Local Cotton Committee which held two meetings one on 14th December, 1924 and the other on 15th January, 1925. The total quantity of Kapas handled by the Department from the controlled area was 3,329 Bhars 9 maunds=79,905 maunds while the quantity of lint obtained was 1,521 khandis (one khandi = 798 lbs.) about 3,042 full pressed bales. This was sold in the open local market at a premium ranging from Rs. 17 to Rs. 25 per khandi.

(2) *Cotton Seed Distribution.*—The total quantity of seed purchased from the above growers and financed from the Director of Agriculture's Personal Ledger Account was 1,803 gallis and 25 maunds = 2,164,699 lbs. and which was distributed mostly in the tract south of the river Narmada as under :—

		Lbs.
*1.	Surat and Broach Districts south of Narmada	1,078,030
2.	Broach and Ahmedabad Districts above North of Narmada	35,550
3.	Navapur and Nandurbar	60,150
4.	Rajpipla State	911,850
5.	Baroda State	63,900
6.	Southern Maratha Country	15,120
	Total ..	2,164,600

* This includes the reserve quantity kept at the various depôts for re-sowings if necessary. The total quantity, however, does not include the cotton seed 20,000 lbs. grown and distributed by the Surat Farm. In all 13 seed depôts were opened in the tract south of the Narmada for cotton seed distribution purposes.

30. *District Agricultural Work* : (*a*) *Demonstration and Shows.*— This consists in bringing agricultural improvements and better practices to the notice of the Rayats, by giving them advice and help in order to improve the general agriculture of the tract. During the year 16 demonstrations were held at different places, *viz.*, 2 in Broach and 14 in North Gujarat. Besides these demonstrations the Kamgars in Surat and Broach districts held small village demonstrations showing the use of various ploughs and implements by giving them free of hire to cultivators of the backward tracts, the total area thus worked being about 120 acres. Demonstrations of the working of the mowing machine were in addition held in grass areas of Pardi, Bulsar and Chikhli Talukas at 6 places and 48 acres of grass was cut in 12 days. As a result 5 machines were ordered out by cultivators, which are already supplied to them.

(*b*) *Implement and Seed Depôts.*—Like last year, 6 implement depôts were continued, mostly in the very backward tracts of Gujarat from which implements are issued at very normal rate of hire or it is not charged at all as at Bulsar Depôt.

(c) *Distribution of Seeds, Implements and Manure.*—In addition to cotton seed distribution distributed by the cotton staff, various kinds of seeds were distributed from the different farms and by the District Agricultural Overseers amounting to 75,975 lbs. consisting of new and improved types of cotton, wheat, groundnut, etc.; 157 implements worth about Rs. 7,875 excluding spare parts and artificial manures about 24 tons worth about Rs. 1,747 were also distributed.

(d) *Demonstration Plots.*—The District Agricultural Overseers and the Kamgars managed 167 demonstration plots on cultivators' fields covering an area of 634 acres to demonstrate different methods of tillage and manuring and improved varieties of crops recommended by the Department.

(e) *Measures to prevent Smut in Jowar.*—Owing to better help rendered by Officers of the Revenue Department in carrying out this propaganda, 17,132 packets of coppersulphate were distributed, which ensured the jowar crop in an area of about 68,528 acres from the damage caused by Smut.

(f) *Agricultural Associations* : (1) The Chorashi Taluka Development Association continued to do good work as before, but was handicapped for want of a permanent fieldman as the second one also left the Association after he was fully trained in the work. There were 472 members of the Association including 13 Patrons and 55 Life members. During the year, besides supply of seeds and hiring out of implements, 600 coppersulphate packets for use against smut in jowar and 67 poison packets against pigs and other wild animals were distributed and 125 country bores were budded with Ajmeri variety.

(2) With great efforts another Taluka Development Association was organised in Jalalpore taluka with the help of the Mamlatdar, Mr. B. J. Patel, L.Ag., and was to start work from the beginning of June, 1925. The first general meeting to constitute the Association had, however, to be postponed till the next fair season owing to the unexpected early rains. Ground has also been prepared to start two or three more development associations in the Division. It is hoped they will start work during the current year.

31. *Agricultural Non-Credit Co-operative Societies.*—The total number of these Societies in Gujarat was increased from 22 to 32. Of the 4 Machinery and implements Societies the Kareli Ginning Society earned Rs. 3,938 on account of hire charges during the year. Of the other Societies, the Cotton Sale Societies occupied a prominent position, the number being increased from 9 to 18 during the year. All of them worked except the one at Dabhali which was started rather late. These had in all 1,421 members, who made cotton sale business to the total value of Rs. 12,66,954 during the season. For their further development, the All Gujarat Co-operative Cotton Sale Societies conferred on 21st December 1924 and a Federation was formed, and representatives from each Society met together every month, in the Cotton season. The Agricultural Organizer, Co-operative Societies, whose services are placed at my disposal for organising Agricultural Non-credit work, was restricted to

work only in Surat District and in Ankleshwar and Hansot talukas of the Broach District which gave better results in organising and developing his work in concentrated areas. Such non-credit organisation work in other Districts has been entrusted to the District Agricultural Overseers concerned, so that they could more easily do it along with their usual work.

32. *Insect and Other Pests* : (*a*) *Katra or Hairy Caterpillar* (*Amsacta mooreii*).—Katra controlling campaign was continued at Dohad Farm, Galalia Falia, Rakhial (near Dakor) and Prantij by dusting Paris Green with different sorts of flours and it was found that gram flour mixture was the most attractive for Katras. Further trials are being made to find out the most economical stuff to be mixed with Paris Green to control the Katras in the best way. The best results are expected from Mowra flowers if they are thrown broad cast in the Katra affected areas or are put in hills after they are mixed with a mixture with gram flour and Paris Green. A leaflet is being prepared and as soon as it is ready it will be distributed in Panch Mahals and North Gujarat along with the poison to all the cultivators who apply for it in time, *i.e.*, April and May. Further investigations as to which baits the Katras like most and which could be easily and cheaply had will be continued.

(*b*) *Granary Pests.*—To have a thorough investigation of this problem, a complete survey of local methods of storage in two typical villages was undertaken and a number of storage experiments were made during the year. The survey determined that the loss caused by different insects to the grains stored by the people at Mota-Varachha and Adajan amounted to about Rs. 3,582 and Rs. 1,345 respectively during the year. The results are ready for publication in the Pusa Journal or the College Magazine, Poona.

(*c*) *Jowar Stem Borer Investigation.*—This was continued by the Special Entomological Assistant, being financed from the Sir David Sassoon Trust Fund. The results are ready for being published as a Memoir.

(*d*) *Other Pests.*—The Entomological Assistant, Surat, attended and controlled other insect pests on various crops at 5 places. He observed two new pests, *viz.* (1) Vejinulus suratansis—slugs that appear at the beginning of monsoon, feeding on chauli leaves in October, 1924, and (2) a new species of aphis found on tobacco leaves, specimens of which have been sent to Pusa for indentification.

33. *Boring.*—One Musto Power Boring Machine with the Boring Assistant working on it was transferred from Sind to Gujarat in April 1925. Two Musto hand machines already working here were converted into Power Boring Machines. One new 6″ Armstrong Power Drill machine was purchased. Out of 9 Cawnpore hand machines one was converted into Power and 8 hand machines were sent back to the Agricultural Engineer, Poona, for adoption for use in the Famine tracts. Thus the number of machines working in this Division at the end of the year was 6 only. The 2 Musto machines converted into Power that were fitted with the Wizard type of 6 B. H. P. oil engine did not work satisfactorily.

In all 28 bores including one incomplete of the last year were undertaken, involving a total depth of 1,927 feet; out of which 17 were successful, giving an increase of 27,185 gallons of water. Out of the remaining 11, six failed and five were left incomplete (*vide* detailed statement attached). Three old bores that were chocked up by sand, etc., were cleaned and set right on application from the well-owners. The total expenditure including permanent boring establishment during the year amounted to Rs. 17,804-6-7 and the total recoveries of boring charges to Rs. 2,356-5-2, those in arrears being Rs. 2,895-3-2.

34. *Mechanical Help to Cultivators and others.*—The Mechanical Assistant's Head-quarters were transferred from Nadiad to Surat in January 1925 which facilitated his work which he got more from Surat and Broach Districts than from Districts of North Gujarat. The Boring Assistant transferred from Sind to Gujarat in April, 1925, was placed at Surat to help the increasing work of the Mechanical Assistant, but soon after his services being found more badly needed in South Central Division, the Boring Assistant had to be sent to Poona in June, 1925. The Mechanical Assistant during the year got 38 enquiries including 5 pending of the last year; out of which 22 were completely attended, four were filed, 8 were in progress and 4 in arrears. It has now been decided to charge nominal fees for the help of the Mechanical Assistant so that he may not receive calls unnecessarily and too often from the same person.

35. *General.*—In conclusion I am glad to say that all with a solitary exception or two have continued to work hard to the best of their respective abilities. The work of Mr. G. P. Pathak, District Agricultural Overseer, Panch Mahals, and now Superintendent, Surat Farm, deserves special mention. My Office staff and specially my Head-clerk Mr. M. S. Bhatye worked very hard and satisfactorily.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat,
Dated 16th November 1925.

APPENDIX

Serial No. of Bores.	Names of Land or Well Owners.	Name of Taluka.	Name of Village.	Date of commencement.	Date of completion.
	Incomplete Bores of last year completed in this year.				
	Ahmedabad District.				
13	Shah Maganlal Bechardas	Prantij ..	Talod ..	10th June 1924.	26th July 1924.
	New Bores undertaken in this year.				
1	Mehta Ranchhod Virchand.	Do. ..	Fatepur ..	25th July 1924.	12th Nov. 1924.
2	Chakuji Hathiji ..	South Daskroi	Kubadthal ..	2nd Dec. 1924.	31st Dec. 1924.
3	Khan Bahadur Rustomji J. Vakil.	Do. ..	Rustompura	31st Dec. 1924.	28th Feb. 1925.
4	Nathabhai Gokalbhai ..	Do. ..	Kubadthal ..	7th Jan. 1925.	22nd Jan. 1925.
5	Becharji Nathooji ..	Do. ..	Do. ..	20th Feb. 1925.	11th April 1925.
6	Khan Bahadur Rustomji J. Vakil.	Do. ..	Rustompura ..	4th Mar. 1925.	2nd April 1925.
7	Hosanji Barjorji Vakil ..	Do. ..	Vatva ..	4th April 1925.	14th April 1925.
8	Chaturbhai Kalidas ..	Do. ..	Kubadthal ..	18th April 1925.	9th May 1925.
9	Hosanji Barjorji Vakil ..	Do. ..	Vatva ..	21st April 1925	.....
10	Jalamsing Becharsing ..	Do. ..	Kubadthal ..	10th May 1925	18th May 1925.
11	Umedram Kalidas ..	Do. ..	Do. ..	21st May 1925.	....
	Surat District.				
1	F. C. Batliwala ..	Pardi ..	Kumta ..	8th Nov. 1924.	8th Dec. 1924.
2	Do. ..	Do. ..	Do. ..	9th Dec. 1924.	16th Feb. 1925.

F.

Actual No. of working days.	Reasons of Stoppages.	Depth of well.	Total Depth of Boring.	Diameter of Bore.	Footage of Pipes used.	No. of Shoes used.
38	1 erection .. 8 for labourers due to rain.	40′	131′	3″	131′	1
30	1 day erection .. 95 for labourers due to rains. 2 dismantling ..	36′ 9″	70′	4″	33′	1
22	2 erection .. 1 labour .. 5 for piping ..	41′	153′	3″	142′	1
30	4 erection .. 1 test .. 25 tools for accident .	40′	77′	4″	70′ 4″ 50′ 2¼″	1
11	2 for erection .. 1 for labour .. 1 dismantling .. 1 Test ..	48′	124′	3″	124′	1
24	1 erection .. 6 repair .. 12 labour .. 4 test .. .. 2 cleaning of engine . 2 dismantling ..	45′	158′	3″	155′	1
12	4 erection .. 8 holi for labour .. 3 test .. .. 3 diameter extraction.	40′	84′	3″	76′ 4″	1
10	2 earth work .. 3 erect and filling .. 1 test ..	47′	71′	4″	71′	1
10	2 erection .. 6 repairs .. 1 tools .. 2 test .. 1 dismantling ..	54′	24′	3″	25′	1
..	....	....	86′	....	....	....
5	2 erection .. 1 test .. 1 dismantling ..	54′	25′	3″	25′	1
..	....	....	103′	....	....	....
10	2 earth work .. 3 erection .. 9 inwait of A.E. .. 5 repair .. 2 test ..	45′	20′	6″	....	....
32	4 earth work .. 3 erection .. 2 cleaning of engine 8 tempering tool .. 9 blasting .. 8 for mechanic ..	33′	44′	6″	....	....

Serial No. of Bores.	Names of Land or Well Owners.	Water before Boring in gallons per hour.	Water level before Boring.	Water after Boring in gallons per hour.	Water level after Boring.	Increase of water supply in gallons per hour.
	Incomplete Bores of last year completed on this year—contd.					
	Ahmedabad District—contd.					
13	Shah Maganlal Bechardas	....	....	....	....	....
	New Bores undertaken in this year.					
1	Mehta Ranchod Virchand.	....	3′	210	9′	210
2	Chakuji Hathiji ..	250	8′	2,250	11′ 4″	2,000
3	Khan Bahadur Rustomji J. Vakil.	1,000	6′	1,000	6′	....
4	Nathabhai Gokalbhai ..	500	20′	4,500	21′	4,000
5	Becharji Nathooji ..	225	9′	1,000	12′	1,225
6	Khan Bahadur Rustomji J. Vakil.	1,000	6′	3,000	13′	2,000
7	Hosanji Barjorji Vakil ..	1,000	16′	3,000	16′	2,000
8	Chaturbhai Kalidas ..	500	15′	1,250	15′	750
9	Hosanji Barjorji Vakil ..	....	....	....	....	....
10	Jalamsing Becharsingh ..	225	18′	1,225	18′	1,000
11	Umedram Kalidas ..	....	....	....	....	....
	Surat District—contd.					
1	F. C. Batliwala ..	*Nil.*	18′	1 Kos. 1,000	18′	1,000
2	Do. ..	1,000	9′	1,000	9′	....

F—*contd.*

No. of strata met with.	Flat charges.	Cost of Pipes and shoes.	Full charges.	Labour charges.	Total Cost.	Cost per Foot.	Result.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
3	262 8 0	148 0 0	..	200 0 0	610 8 0	4 10 0	Failure.
2	185 0 0	84 12 0	6 8 0	90 0 0	366 4 0	5 3 8	Successful.
2	462 0 0	176 12 0	26 8 0	91 8 0	756 12 0	4 15 0	Do.
2	148 4 0	114 8 0	50 0 0	200 0 0	512 12 0	6 10 7	Failure due to Accident.
2	359 0 0	145 0 0	11 4 0	68 0 0	583 4 0	4 11 3	Successful.
2	482 0 0	172 0 0	26 8 0	110 0 0	790 8 0	5 0 0	Do.
2	269 0 0	124 12 10	23 14 0	114 8 0	532 2 10	6 5 4	Do.
2	223 8 0	118 4 0	23 4 0	60 0 0	425 0 0	5 15 9	Do.
3	60 0 0	42 0 0	14 8 0	45 0 0	161 8 0	6 11 8	Do.
....	..	..	..	..	..	..	Incomplete.
3	62 8 0	42 0 0	7 4 0	20 0 0	131 12 0	5 4 4	Successful.
....	..	..	..	..	..	..	Incomplete.
1	60 0 0	..	43 4 0	40 0 0	143 4 0	7 2 7	Successful.
1	77 0 0	..	113 0 0	75 0 0	265 0 0	6 0 4	Failure.

Serial No. of Bores.	Names of Land or Well Owners.	Name of Taluka.	Name of Village.	Date of commencement.	Date of completion.
	New Bore undertaken in this year—contd.				
	Surat District—contd.				
3	F C. Batliwala ..	Pardi ..	Kumta ..	17th Feb.1925.	22nd Feb. 1925.
4	Do. ..	Do. ..	Do. ..	23rd Feb.1925.	4th Mar. 1925.
5	Do. ..	Do. ..	Do. ..	8th Mar. 1925.	16th April 1925.
6	Fordunji Barjorji ..	Do. ..	Chalia ..	17th April 1925.	24th April 1925.
7	Bhikhubhai Ramprasad	Do. ..	Do. ..	26th April 1925.	19th May 1925.
8	Motiram Raghavji ..	Olpad ..	Sayan ..	21st April 1925.	6th May 1925.
9	Do. ..	Do. ..	Do. ..	15th May1925.	31st May 1925.
10	Kunverji Lallubhai ..	Pardi ..	Tuikawada ..	20th May1925.	.....
11	Lalbhai Kalyanji ..	Chikhli ..	Kharsali ..	30th April 1925.	....
	Broach District.				
1	Ambaidas Bhikhabhai ..	Vagra ..	Ankot ..	24th June 1924.	23rd Oct. 1924.
	Panch Mahals.				
1	Thakore Saheb of Dhari..	Pandullewas..	Dhari ..	26th April 1925.	15th May 1925.
2	Kalal Bhagwanlal Ganesh.	Rewa-Kantha.	Pipiod ..	21st May 1925	....
	Baroda State.				
1	Bhagubhai Dwarkadas ..	Kamraj ..	Antroli ..	12th Nov. 1924.	28th Feb. 1925.
2	Do. ..	Do. ..	Pardi ..	10th Mar.1925.	17th April 1925.

F—*contd.*

Actual No. of working days.	Reasons of Stoppages.	Depth of well.	Total Depth of Boring.	Diameter of Bore.	Footage of Pipes used.	No. of Shoes used.
2	1 earth work 1 erection 1 test	26′	16′	6″	....	....
3	1 earth work 2 test 1 cleaning of engine 3 orders	26′	22′	6″	....	....
26	3 erection 2 labour 4 cleaning of engine 4 dismantling 4 extraction	45′	131′	6″	....	....
2	2 earth work 2 erection 1 test 1 dismantling	30′	24′	6″	....	....
16	3 erection 2 engine cleaning 1 test 2 dismantling	45′	142′	6″	5′	....
8	4 erection earth work 2 tools preparing 2 test	52′	19′	4″	9′	....
13	2 erection 1 dismantling 1 repair	52′	53′	6″	8′ 6″	....
..	....	....	6′	....	....	....
..	....	....	15′ 6″	....	....	....
11	4 erection 13 labourers 2 repair 86 rains 3 test 3 dismantling	45′	84′	4″	84′	1
13	6 erection and filling 1 dismantling	25′	21′	4″	....	....
..	....	....	1′ 6″	....	....	....
69	9 erection and earth work 12 rock test 7 piping 6 repair 4 ropes 2 dismantling	72′	206′	4″	210″	1
18	2 earth work 4 erection and fitting 3 wheel 4 fire 3 test 2 dismantling 2 engine cleaning 1 trial	64′	66′	6″	8′	....
			1,977′			

Serial No. of Bores.	Names of Land or Well Owners.	Water before Boring in gallons per hour.	Water level before Boring.	Water after Boring in gallons per hour.	Water level after Boring.	Increase of water supply in gallons per hour.
	New Bore undertaken in this year—contd.					
	Surat District—contd.					
3	F. C. Batliwala ..	....	8′	1,000	10′	1,000
4	Do.	....	10′	1,000	10	1,000
5	Do.	1,000	21′	1,000	21′	*Nil.*
6	Fordunji Barjorji ..	....	12′	1,000	19′	1,000
7	Bhikhubhai Ramprasad	....	12′	....	12′	....
8	Motiram Raghavji ..	1.000	8′	2,000	10′	1,000
9	Do.	2,000	10″	3,000	10′	1,000
10	Kunverji Lallubhai ..	....	....	....	....	....
11	Lalbhai Kalyanji ..	....	....	....	....	....
	Broach District—contd.					
1	Ambaidas Bhikhabhai ..	500	9′	3,500	9′	3,000
	Panch Mahals—contd.					
1	Thakore Saheb of Dhari	....	....	500	3 feet below bottom of well.	500
2	Kalal Bhagwanlal Ganesh	....	....	....	....	....
	Baroda State—contd.					
1	Bhagubhai Dwarkadas ..	....	5′ 6″	3,500	21′	3,000
2	Do.	1,000	11′	2,500	11′	1,500
					27,185	

F—*contd.*

No. of strata met with.	Flat charges.	Cost of Pipes and hoes.	Full charges.	Labour charges.	Total Cost.	Cost per Foot.	Result.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	48 0 0	..	11 14 0	15 0 0	74 4 0	4 10 3	Successful.
1	66 0 0	..	8 0 0	12 0 0	86 0 0	3 14 6	Do.
1	285 4 0	..	86 8 0	60 0 0	431 12 0	3 4 3	Failure.
1	72 0 0	..	11 4 0	12 0 0	95 4 0	3 15 6	Successful.
1	315 8 0	15 10 0	60 0 0	40 0 0	431 2 0	3 0 7	Failure.
1	57 0 0	15 12 0	19 4 0	40 0 0	132 0 0	6 15 2	Successful.
1	160 8 0	26 9 0	26 8 0	45 0 0	258 9 0	4 14 0	Do.
..	..	..	..	..	..	..	Incomplete
..	..	..	..	..	..	..	Do.
2	269 0 0	53 0 0	20 0 0	50 0 0	492 0 0	5 13 9	Successful.
1	63 0 0	..	39 12 0	50 0 0	152 12 0	7 4 3	Do.
..	..	..	..	..	..	..	Incomplete
4	519 8 0	289 8 0	139 8 0	250 0 0	1,198 8 0	5 13 1	A failure; water tapped is brakish and not fit for irrigation purpose.
2	206 0 0	25 0 0	42 8 0	75 0 0	348 8 0	5 4 6	Successful.

APPENDIX G.

Summary of Work done under the Deputy Director of Agriculture, Konkan, during the Year 1924-25.

General.

1. *Charge.*—Mr. V. G. Gokhale resumed charge of the Division from 17th November 1924 after the termination of his officiating appointment of the Professor of Agriculture, Agricultural College, Poona, during which period Mr. K. M. Pawar held the charge.

2. *Lines of work and organisation.*—The only change of importance in the detailed organisation is the scheme of co-ordination between the Revenue and Agricultural Departments for carrying on Agricultural propaganda.

3. *Staff.*—The strength of the superior technically educated staff of assistants stood in the year at 7 for Research and Experiment, 6 for Extension and Propaganda, 1 for Agricultural Education and 1 in training; the decrease by one under Research and Experiment staff is due to one post of graduate fieldman being kept in abeyance and the increase by one under Extension and Propaganda is due to the inclusion of the post of the Boring Assistant.

4. *Cost of the year's work.*—The total expenditure of the Division amounted to Rs. 1,05,338 as against Rs. 1,04,128 of the previous year, the distributions under each broad division of activities being Rs. 32,226 for Research and Experiments, Rs. 42,532 for Extension and Propaganda including boring and grants to Taluka Development Association, Rs. 12,836 for Agricultural Education and Rs. 16,534 for Direction and Superintendence.

The cash receipts during the year amounted to Rs. 8,634 as against Rs. 5,883 of the previous year.

5. *Physical and other conditions influencing the agriculture of the year.*—The rainfall of the year 1924 was on the whole better than in the previous year resulting into excellent crops of rice which were upto 50 per cent. more than in the last year in the South Konkan and upto 25 per cent. more in the North Konkan. The year was also characterised by an unusually cold winter which affected the rabi season crops adversely to some extent.

As regards pests and diseases, there has not been anything specially unusual during the year over what has been mentioned in the previous report.

6. *Results of the year.*—These are summarised below under the headings of the main lines.

Research and Experiment.

7. *Researches into the increasing of yield or bringing about an economy in the cultivation of rice by methods other than breeding.*—The physical

factors which contribute towards making up the yield, and the best and the most economic ways to influence their action have been under an intensive and exhausti e study at Karjat Rice Research Station for the last five years. The rice experimental work at Kumtha was continued to supplement the work at Karjat in order to represent quite different sets of conditions of soil and climate.

It has been found that chances of increasing the size of the ear-head without decreasing its number seem to lie in the following directions :—

(*i*) A single rice seedling unrestricted in space is capable of giving 100 bearing tillers yielding 30 tolas of grain.

(*ii*) Use of silt, phosphates as insoluble lime phosphate and sulphate of potash.

(*iii*) Giving a dose of sulphate of ammonia at the stage of the plant at which it shows a sudden increase in nitrogen content, gives a decided increase in the number and size of bearing tillers.

(*iv*) Transplanting twice with conditions of high fertility.

In regard to the second point of water-supply the results indicate that a rice crop uses up in the open natural condition as well as under artificially controlled supply, water equal to about 25 inches of rainfall for transpiration and evaporation giving a ratio of 600 times of dry matter produced and critical stage has yet to be found out.

The most important findings of rice investigation on the Kumtha Farm having laterite soil are that :—

(1) Situations which are favoured with under-ground springs (these hardly represent 10 per cent of rice land) of water generally show very high fertility and give large returns for any special manurial treatment such as bone-meal.

(2) Bone-meal alone or in addition to farm yard manure has given large increases from 50 to 75 per cent. under different conditions this year while in the previous one it had hardly any advantage when unaccompanied by farm yard manure. This different behaviour in different seasons cannot yet be explained.

(3) That sulphate of ammonia can be effective on soils represented by Kumtha only when accompanied by farm yard manure is further confirmed.

(4) The dry or green leaf which is commonly available and collected for manure in Kanara is not effective if not turned into manure along with cattle dung and urine, although green leaves of *Terminalia paniculata* and *Calatropis gigantia* act well in their natural state also.

8. *Other experiments on rice.*—Sowing of rice seed *in situ* in squares so as to admit of intercultivation by implements and thus to do away with the labourious process of transplanting is not generally successful except under exceptional conditions. Sulphate of ammonia is almost immediately fixed by rice soils derived from trap. The early strain of

Kolamba rice—Karjat No. 79—appears to be suitable for Ratnagiri conditions.

9. *Selection and breeding of higher yielding strains of rice for South Konkan.*—The work started at the Ratnagiri Agricultural Station underwent its second year's course of isolating the most promising ones. In the early group there are many which have yielded up to 35 per cent. higher than the local, while in the late one, only three giving an increase of 15 to 20 per cent. have been found. Sixteen strains from both groups giving the highest yields have been selected for further intensive study, while about 100 more have been continued as reserves for further observation. It is observed that for late rices at Ratnagiri the question of borer attack seems to be the critical factor in the success of any variety.

10. *Remedial measures against rice land crabs.*—The study of the life history and remedial measures against the land crab taken up since the year 1922, as requiring the first attention amongst several zoological problems of the Konkan, has during the year under report brought to light further information about the difference in the soils and situations of fields favourable for the different species of crabs and about the probable time of mating. As regards remedial measures, poison baits of paris green, white arsenic, lead chromate and barium carbonate with baits of boiled rice which were found effective in the laboratory trials were not found successful under natural field conditions. Liming at the rate of 3,630 lbs. of air slaked lime was found to be successful without any harmful effect on the rice crop. Two new substances—copper sulphate in very minute doses and tobacco decoction—were found to be fatal to crabs in the laboratory trials.

11. *Selection and breeding of higher yielding strains of Nagli (Eleusine coracana).*—This is being done at Hatkhamba, ten miles east of Ratnagiri. The year of report is the fourth of taking up this work. The relative position of the twelve promising strains under intensive study has remained more or less parallel in the three years and they are breeding pure; in replications under different soil conditions, they show wide range in yields. Six out of the twelve strains are substantially superior to local kinds, the increases varying from 25 to 50 per cent. and are fairly consistent with their previous performence. The first two out of these, namely E-31 and E-82 giving 45 and 32 per cent. increases in the year under report, are ready to be tested on a field scale and under cultivators' conditions. The reserve lot has yielded six strains which are as good as or some of them even better than the best ones mentioned above and are therefore worth promoting to the intensive study series.

More evidence has been noticed which leaves no doubt about the chances for natural cross-fertilization and also possibilities of artificial crossing in *nagli*.

12. *Experiments on manuring, distance of planting and new varieties of sugarcane in Kanara.*—The results with bone-meal in as small quantities as 200 lbs. costing Rs. 10 to 12 per acre given in addition to farm yard manure show on the Kumtha Farm 20 per cent. increase in yield, *i.e.*, at

least worth Rs. 150 per acre and more than corroborate the previous years' results with 11 per cent. increase. 150 lbs. of nitrogen per acre taken up for trial on the Kumtha Farm since last year has given increases of 25 to 40 per cent. over the yield from half the quantity in the case of Red Mauritius.

A three feet distance is found to be about as good as $2\frac{1}{2}$ on the Kumtha Farm.

Two varieties, H.M. 544 and 312, evolved by and recommended by the Mysore Department of Agriculture have been taken up for trial for the first time in the Kanara district.

13. *Experiments in increasing the yields and profits from cocoanuts in Konkan.*—Farm yard manure has not produced any disadvantage as alleged by the cocoanut growers in Kanara ; it is too early yet to get conclusive results of other manurial treatments tested.

The two dwarf and reputed varieties from Malay States and Cochin planted last year on the Kumtha Farm have been showing distinct signs of quick growth.

There is no relation between the size of eyebud and thickness of the kernel to the vigour of seedlings. It has come to light that an enormous proportion (70 per cent.) of the female flowers drop down in six weeks from opening of the spathe and if by extensive observation this is found to be general, the problem becomes of great and vital importance to be taken up in hand immediately.

14. *Bourbon tree cotton on varkas lands in Ratnagiri.*—The year's experience exactly corroborates the findings of the previous year that the only chance of success is on deeper well drained grades of varkas lands.

15. *Safflower as a rabi crop in moisture retentive rice lands.*—Safflower was again tried this year in unfenced fields with the result that the crop grew well but the spines in the young stage of the crop, when they are small, green and tender did not prove to be deterrent to cattle.

16. *New Garden Crops.—Parwar* (*Trichosanthes disica*), a highly valued cucumber kind which was so long regarded as possible only in certain places of North Gujrath, was tried by certain enterprising cultivators in the Thana garden tract and has been found to grow successfully and fetching a very high value.

17. *Best way of utilising bare Minor Forest areas for supply of leaf manure.*—This is the fourth year of the experiments on the Kumtha Farm. During the year two more species of plants—*Vangueria spinosa* and *Cassia siamea*—were added ; but the second could not survive through the dry season, while the former has done so. All the species which have survived so far have progressed slowly. In regard to the quantity of green matter obtainable, *Tephrosia candida*, if it could be established, will give the largest quantity amongst those so far tried. The local shrubs, *Memecelon edule*, *Gardenia gummifera* and *Eugenia corymbosa*, found dominantly

occupying these lands, are no more quick growers than the rest. The manurial value as tested on rice a second year is found to be as follows :—

As green, *Calatropis gigantea* tops the list with 100 per cent. increase over farm yard manure, *Strychnus nuxvomica* closely following ; *Vangueria spinosa* comes next with 20 per cent. increase ; *Terminalia tomentosa* and *paniculata*, *Eugenia corymbosa* and *Memecelon edule* are less than, while the rest are about equal to farm yard manure. This agrees more or less with people's opinion about them with the exception of *Terminalias*. Dry leaves are invariably poorer than green except in the case of *Eugenia corymbosa*.

Last year's further experiments on *Calatropis giyantia* have not led to any more information which will ensure successful establishment of its plantations.

18. *Lac culture.*—Inoculations made successfully on *Ziziphus* and *Butya* shrubs at Karjat (at the foot of the Western Ghats) last year with brood-lac sticks on *Ziziphus jujube* obtained from Pusa gave another brood locally surviving the heavy rains and high May heat which is thriving fairly.

Extension work.

19. This work is principally carried on through the itinerent district staff who are called Agricultural Overseers assisted by Kamgars.

In addition to the institution of Divisional Boards and Taluka Development Associations for agricultural and co-operative propaganda, a new and welcome feature of the year is the Government Circular issued in January 1925 about the co-ordination between the Revenue and Agricultural Departments for carrying on agricultural propaganda.

20. *The work of the Konkan Divisional Board during the year.*—The Deputy Director of Agriculture, Konkan, continued to be the Chairman of the Board throughout the year. All the quarterly meetings were regularly convened and attended with quorum. The non-official members on the Board during the year were as follows :—

1. Mr. K. T. Karulker, Umbergaon, District Thana. 2. Mr. V. V. Nilekani, Sirsi, District N. Kanara.	Representatives of Agricultural movement.
3. Mr. V. K. Sanjanwala, Umbergaon, District Thana. 4. Mr. V. V. Athalye, Shiposhi, District Ratnagiri.	Representatives of Co-operative movement.

21. In addition to the administrative work of exercising general control and supervision of the agricultural and general propaganda through the Government Departments and Taluka Development Associations, the Board considered during the year many important subjects. These together with the recommendations of the Board and replies from the

Joint Board of the Director of Agriculture and the Registrar, Co-operative Societies, Bombay Presidency, Poona, are given in the following statement.

Serial No.	Recommendation of the Konkan Divisional Board.	Joint Board's reply.
1	Non-Credit Agricultural Societies should be allowed to supply articles on credit where there are no co-operative societies for the same.	In the negative.
2	Appointment of Honorary Agricultural Organisers.	Do.
3	Improvement of the condition of Co-operation in Kolaba.	
4	Relaxation of the rigour of the existing rules regarding tapping of date palm for Gül manufacture in Thana District.	The Deputy Director is requested to make a case.
5	Need, scope and methods of improvement of cattle in Konkan.	
6	Special concession rates for the conveyance of town sweepings, etc., from Bombay for Agricultural purposes.	Under consideration.
7	Co-operative Societies for the consolidation of holdings :—	The case of Umbergaon recommended to Government for facilities and concessions.
8	Agricultural School for the Ratnagiri District.	Not accepted.
9	Exemption from flat charges for unsuccessful bores.	Government have sanctioned it temporarily.
10	Special concession rates for the conveyance of concentrated manures.	Under consideration.
11	Exemption from water cess granted to pumping installations should be extended to all kinds of water lifts.	Joint Board is making representation to Government.
12	Spread of information of Agricultural Improvements to the widest possible extent by the distribution of printed vernacular literature to all co-operative societies, to the village schools and to Talathies and to have these read by them to gatherings of villagers at least every three months.	The subject concerned is an administrative matter and would be dealt with in usual Departmental manner.
13	Insistance on a guarantee of sufficient funds from local contribution for the formation of Associations :—	Approved.
14	Special grant of Rs. 400 to Sirsi Association for poisoning wild animals and combating against Koleroga.	Sanctioned not as subsidy but for specific purpose of propaganda by the Agricultural Department.
15	Investigation of the problem of Improvements of colour of Gul in Konkan.	Reply awaited.
16	Year of the Taluka Development Associations, to be the financial year.	Do.
17	Necessity of a magic lantern for each district.	Do.
18	Appointment of an Agricultural Organiser C. S. for Kanara.	Not possible to arrange.
19	Protection of crops from wild animals.	
20	Special grant to Dapoli Association for pig-killing, and revival of rewards for pig-killing in the Ratnagiri District.	Reply awaited.

Serial No.	Recommendation of the Konkan Divisional Board.	Joint Board's reply.
21	Supply of copies of G. Rs., circulars and Publications bearing on Agricultural and co-operative movement to the non-official members of the Divisional Boards.	Reply awaited.
22	Demonstration of utilization of lands (varkas) growing grass for more remunerative crops.	Awaited.

A. Through the direct Agency of the Agricultural Department

22. *Staff and sphere of operations.*—These are indicated against respective districts in specifying the items of improvements for each.

23. *Co-ordination between Revenue and Agricultural Departmental staff for carrying on agricultural propaganda.*—This was done as much as possible according to the provisions of the Government Circular. The first annual meetings were held with the officers of the Revenue Department and members of the Local Boards for all the districts of the Konkan Division except Ratnagiri to discuss and adopt the programmes of improvements and the nature of assistance the Revenue Department can render. Distribution of improved strains of rice in the Thana and Kolaba districts and spraying against koleroga in the Kanara District were the items in which assistance of the Revenue Department was specially sought for and has been useful to some extent.

24. *Items of propaganda.*—The detailed items of improvements proved to be worth introducing which have formed the activities of the year are given below by each district :—the items shown in italics represent the major ones.

Thana District.—(Chiefly Dahanu, Umbergaon, Salsette and Bassein talukas and Mahim Taluka Development Association) :—One Graduate Overseer and one Kamgar.

(1) *High yielding strains of rice*, (2) *Labour saving methods in garden cultivation*, (3) Manuring of plantains with a mixture of nitrate of soda and superphosphate, (4) *Use of artificial manures for garden crops*, (5) Extension of garden cultivation, (6) Improved breed of poultry and (7) Silage.

Kolaba District.—(Chiefly Karjat, Pen and Panwel talukas and Alibag and Kalyan Taluka Development Associations) :—One Graduate Overseer, one Store-keeper and one permanent Kamgar and temporary kamgars employed for short periods for roguing and distribution of rice seed.

(1) Stimulation of irrigation farming on the Tail Waters of the Tata Hydro-Electric Works together with all improvements possible, (2) *Substitutes to meet the deficiency of rab for rice*, (3) Meston plough, (4) *High yielding strains of rice*, (5) Nitrate of soda for onions,

(6) Blade harrow for puddling, (7) Bulsar rahat, (8) Leg-horn breed of poultry.

Ratnagiri District.—(Chiefly Sangameshwar and Devgad talukas and Ratnagiri, Dapoli, Rajapur Taluka Development Associations)—One Graduate Overseer.

(1) Bone meal, fish manure and sulphate of ammonia for rice, (2) Mass selection of rice seed, (3) *Deccan harrow for puddling rice fields,* (4) New profitable crops of sweet potatoes and *kharif* chillies on *varkas* lands, (5) Guinea grass on *varkas* lands, (6) New and profitable crop of onion, (7) Extension of sugarcane cultivation, (8) Poisoning of wild animals, (9) Meston plough, (10) Sabul plough ; (11) Hand weeding tools, (12) Mote, (13) Spraying against mango hoppers, (14) Improved breeds of poultry, (14) Silage, (16) Surti buffalo bull at Ratnagiri.

Kanara District.—(All over the district including Sirsi and Karwar Taluka Development Associations) :—Two Graduate Overseers, two fieldmen and two kamgars.

(1) Mass selection of rice seed, (2) *Bone meal manure for rice,* (3) Fish and ammonium sulphate in seed-bed for rice, (4) Sulphate of ammonia for paddy in East Kanara, (5) Mascaty variety of rice, (6) Planting fewer seedlings, (7) Half seed rate, (8) *Red Mauritius and other high yielding varieties of sugarcane,* (9) *Use of concentrated manures such as sulphate of ammonia, fish and undicake for sugarcane,* (10) Wider planting and efficient and more economic tillage by Sabul plough, (11) *Improved gul boiling furnaces and pans,* (12) *Groundnut on hakkal lands,* (13) *Vari* on *hakkal* and *kumri* lands, (14) *Onion cultivation together with top dressing with concentrates,* (15) Tobacco cultivation, (16) Improved rice land puddler, (17) *Spraying against koleroga of betelnut,* (18) Pig proof wire fence, *poisoning of wild animals,* and organisation of communal watching for the protection of crops from wild animals, (19) Extension of grafted mangoes, (20) *Silage in East Kanara,* (21) Introduction of new and more profitable *hakkal* land crops in East Kanara, (22) Surti buffalo bull at Kumta, (23) green manure crops in cocoanut gardens, (24) Guinea grass as a fodder crop in gardens.

Well Boring.—All districts.

General Propaganda.—All districts :—While carrying on propaganda in connection with specific improvements detailed above, dissemination of general knowledge of improved methods of agriculture, giving advice answering querries are also done by means of literature talks and discourses and magic lantern shows.

25. *Resume of Results.*—The resume of progress obtained at the end of the year under the items specified above is as follows :—

For the purpose of bringing the various improvements to the notice and into the practice of cultivators, the demonstration plots on cultivators'

fields numbered as follows in comparision with those of the last year :—

Year.	Thana.	Kolaba.	Ratnagiri.	Kanara.	Total.
1923–24	Not reported	18	32	106	156
1924–25	27	28	28	161	244

The year has added its quota to the progress under the various items with more or less rapidity as they fit in with the economic and temperamental conditions of the people to a more or less degree.

Spraying against *koleroga* (mildew) disease of betelnut in Kanara has continued to receive an enthusiastic response.

The higher yielding strain No. 42 of *kolamba* rice the distribution operations of which were extended to cover an area of about 5,000 acres in the Karjat, Pen, Panwel and Kalyan talukas of the Thana and Kolaba districts has maintained its increase of 20 to 25 per cent. and has become popular. It is estimated that automatic spread would come to thrice as much. Arrangements have been made to repeat the operations in the same talukas and extend them to Murbad, Shahapur, Mahim and the early strain No. 79 in the Umbergaon peta of the Thana District.

Red Mauritius variety of sugarcane has practically replaced the local less yielding kinds in the whole of Kanara District except a few difficulty accessible parts.

Onion cultivation is now well-known and fixed in the coastal belt of the Kanara District, its further extension depending on finding varieties immune to tip wither disease.

Artificial manures have caught the imagination of the garden cultivators in the Thana District owing to the high prices for oil cake and cheapening of artificials.

Bone meal manure for rice in the laterite districts of Ratnagiri and Kanara is going forward but slowly, the reasons being that it has not shown highly striking results under all conditions and that the small tenant cultivators of rice do not think the advantage to be enough to go in for it with borrowed capital.

Enclosures of blocks of fields with stone-walls or pig proof wire fencing have impressed the cultivators in East Kanara and are showing signs of serving as a strong factor in bringing about rehabilitation of the tract under decay. Their wide spread adoption on joint or individual basis is waiting for the availability of funds. A special bold and liberal policy to allow credit of prospective value of enclosed land seems necessary, as the present value of waste lands is practically nil.

The progress secured by the general propaganda is summarised in the following statement :—

District.	Number of villages.			Number of people.				
	No. got in touch during the year.		Progressive total by the end of the year.	Come in contact during the year.			Progressive total by the end of the year.	
	Total.	New.		Total.	New.	Taking up or likely to take up improvements.	Total.	Taking up or likely to take up improvements.
Thana ..	114	42	163	145	20	60	60	60
Kolaba	342	54	496	1,518	14	700	4,331	2,689
Ratnagiri ..	24	..	75	174	8	3	1,223	63
Kanara	298	66	473	3,270	1,206	235	8,272	3,387
Outside the Konkan Division.	10	4	37	29	11	information not available.		
Total ..	788	166	1,244	5,136	1,259	998	13,886	6,199

The following items have been now sufficiently popularised so that no further propaganda is necessary in them :—

Kanara District.—The crop of *vari* on *makki* and *kumri* lands.

It has also been conclusively proved that the following do not at all fit in with the agricultural, economic and temperamental conditions of the people and there is no need to go on further with them.

Thana and Ratnagiri District.—Ensilage.

Kolaba District.—Nitrate of soda for onions, as there is practically no onion cultivation in the present jurisdiction of direct work.

The experimental work has conclusively proved by the end of the year the suitability of the following *new items* of improvements which will be included in the programmes of propaganda work from the next year.

Kolaba District.—Sulphate of ammonia as a field manure for rice.

Kanara District.—Tapioca.

26. *Arrangements to supply implements, manures, seeds and other articles.*—In order to meet the demands which are created as a result of the propaganda work for articles which are not an ordinary market commodity, the organisation for sale and hire depôts and free agency work for arranging supply of others direct from the firms were continued. bonemeal manure, sulphate of ammonia, Meston plough, Poona gul boiling pans and sugarcane mills, pig proof wire fence, arm dynamites for making pits for mango planting and mango grafts were the most important of the articles thus dealt with amounting to a total value of

Rs. 34,106. Arrangements to supply denaturalised salt for manurial purposes duty free were continued.

27. *Well boring for cultivators.*—Two Musto hand machines were converted to work by oil-engines. Three of the power and one hand machines were allotted to the Thana District where there has been the greatest success and demand for well boring, while one hand machine has been allotted to each of the remaining three districts in which boring is yet in an exploratory stage. The total footage bored during the year amounted to 1,662 feet against 2,045 feet of the previous year.

The statement of detailed information prescribed in Government Resolution No. 7075, Revenue Department, dated 5th May 1925 is appended separately.

The capital and nett expenditure on well boring during the last financial year amounted respectively to Rs. 2,904 and Rs. 7,920 and the receipts to Rs. 2,508.

This year's work has been less than that during the previous year, on account of two of the hand machines being out of work during a period of five months when they were under conversion to power, and one of them being practically out of work during the course of the year, owing to its new engine having a defective piston. The works in the Kolaba, Ratnagiri, and Kanara districts are all under exploratory stage and the orders being few and far between, a good deal of time is wasted in transport and non-supply of labour. The work is somewhat short of the full normal capacity due to incompetence of the Boring Assistant for administration and organisation. Steps have been taken to replace him with a more competent person.

B.—Through Local Non-Official Organisations.

28. *Taluka Development Associations according to Government Scheme.*—No new associations were allowed to be formed during the year unless and until sufficient guarantee to raise the local share of contributions for at least five years' expenditure was forthcoming. Thus they stood the same as at the end of the last year, *viz.*

Thana.—Mahim and Kalyan, *Kolaba.*—Alibag, *Ratnagiri.*—Ratnagiri, Dapoli and Rajapur. *Kanara.*—Karwar and Sirsi, all registered under the Co-operative Act.

All of them were given advice and guidance and supervision. The programmes followed by them were generally on such items of the propaganda work as are suitable to the respective talukas out of those mentioned for each district above. Government subsidies as follows were paid by the Director of Agriculture on the recommendation of the Konkan Divisional Board :—

Mahim Rs. 900, Kalyan Rs. 250, Dapoli Rs. 700, Rajapur Rs. 800, Sirsi Rs 600.

The Mamlatdars were on the managements as *ex-officio* Vice-Presidents of all the Associations except Rajapur in which Mr. K. R. Shitut, the

present Mamlatdar has been elected to be the President. Very few however have taken real, heart felt interest in the work of the Associations, the only outstanding exception being Mr. K. R. Shitut of Rajapur.

Sirsi has done the best work, Rajapur, Mahim, Dapoli and Karwar, come next, Alibag, Ratnagiri and Kalyan having very little work to their credit stand last. None of the Associations have been able to do any Co-operative work, for the reason that the one fieldman whom they can at the most afford to employ has more than full work in Agricultural propaganda and besides a paid man of the status and knowledge of a Non-Graduate fieldman can hardly possess the necessary influence required to stimulate Co-operative organisation.

The Associations find a great difficulty in collecting the local share of contributions and unless, some scheme of ensuring the supply of funds can be devised, it is apprehended that these Associations would be gradually defunct.

29. *Stimulation of Co-operation for promoting Agricultural Improvements* :—The Agricultural propaganda staff are side by side with individual persuasion, also expected to stimulate, investigate, assist and advise, Co-operative effort for promoting Agricultural improvements. The special paid Organiser for Agricultural Co-operation in Thana, Kolaba, and Ratnagiri districts attached to this Division since 1923 continued his activities in this direction. Unfortunately, however, there was again a change in the personnel by the middle of the year and the second half of the year was therefore occupied in acquainting and training a new recruit in the work.

In all 22 proposals of investigation and stimulation new as well as those continued from the previous years consisting of 8 enclosure, 5 Irrigation, 4 Agricultural requisite supply, 2 cultivation, 2 sale and 1 Dairy received attention during the year out of which 13 mostly in Kanara district were dealt with by the Agricultural propaganda staff. Only two schemes mentioned below out of these were completed and resulted into the final formation.

1. Enclosure Society at Nandikatti, Peta Mundgod, district Kanara.
2. Enclosure Society at Hungund, district Kanara.

There were thus 20 non-credit Agricultural Societies in the Konkan Division at the end of the year, which were given all possible assistance, advice and supervision to improve them wherever necessary and possible. All except most of the manure Societies in the Thana District are progressing fairly steadily.

The Agricultural Organiser had besides in hand the liquidation proceedings of three Societies entrusted to him one of which was completed during the year.

The stimulation and working of Agricultural Co-operative schemes is an extremely difficult and slow task requiring in most cases, such as enclosure, irrigation, consolidation and cultivation, etc., the combination of each and every person in the block, while sale and agricultural requisite supply are confronted with tremendous opposition from the existing middle-men.

C.—Through Publications.

30. A Bulletin on Land Crabs as Agricultural Pests in Western India was published under the authorship of Mr. P. V. Wagle, Entomological Assistant, Konkan.

Notes and articles were contributed to the various agricultural and other magazines by the members of the staff of which there were 48 extracts, abstracts and adaptations of information already published before and 36 original ones.

31. *The Konkan Agricultural Magazine.*—The monthly magazine in Marathi devoted exclusively to Konkan Agriculture under the name *Konkan Sheti Samachar* commenced by Mr. Y. G. Gurjar of Alibag in the year 1917 and the editing of which was taken over by the Konkan Agricultural Department was regular in publication under the editorship of Mr. G. B. Pandit, L.Ag. Agricultural Demonstrator, Mundgod, District Kanara, for which he and others who contributed and Mr. Limaye who published the same punctually deserve the best thanks. Its circulation at present stands 603 copies which is more by 30 copies as compared to the last year.

AGRICULTURAL EDUCATION.

32. *The Agricultural Middle School in Vernacular.*—The year under report is the eighth of the Agricultural School at Jambul near Kalyan, district Thana, for giving agricultural education of a primary nature through Marathi primarily for the Marathi speaking Konkan districts.

The year opened with 25 students, 18 in the first year and 7 in the second year. At the end of the year however, three from the first year dropped out. All of the senior class and 11 of the junior class passed in the annual examination.

The total expenditure of the school including the teaching staff and free boarding expenses amounted to Rs. 12,889 and the total receipts to Rs. 2,317 as against Rs. 12,793 and Rs. 1,308 respectively of the previous year.

Out of 54 boys turned out successful from this school up to now, 7 having just passed out have yet to start an occupation, 9 are managing their lands, 7 are in service connected with agriculture, 4 continuing ordinary secondary education, 13 are engaged in business other than that of agriculture and whereabouts of the rest are not traceable.

Thirty-five applications were received for the fresh class of next year; but only 18 (2 from Thana, 4 from Kolaba, 4 from Ratnagiri and 8 from outside Konkan) have actually joined. It is still the land holders of advanced class that are availing of agricultural education in this form.

33. *Agricultural Bias Classes in the Rural Primary Schools.*—The primary School teachers were trained in Agriculture in the Jambul Agricultural School. Agricultural bias classes have now been introduced in two schools in each of the four Konkan districts. These schools are under the control of the Educational Department but all of them were visited

by the members of the Agricultural Department and found to have made a good start with the exception of Tarkhad in the Thana District.

34. *Training of men for special agricultural purposes.*—Two Kamgars for meeting the demand from private farms or for carrying on agricultural propaganda of Taluka Development Associations were trained during the year.

One officer deputed by Coorg Agricultural Department for receiving training in Rice Research methods was entertained at the Karjat Rice Research Station.

Crop Tests.

35. In accordance with Government orders contained in Government Resolution No. 601 of 21st January 1914 Revenue Department the graduate staff took during the year crop tests on rice, nagli and sugarcane crops as usual.

PERSONAL.

36. Mr. Mokashi, Boring Assistant has been found to be definitely incompetent to do the work properly and steps are being taken to replace him with a better man. All others have continued to work faithfully and hard, to the best of their respective abilities and capacities. Amongst the clerical staff of my office, Mr. N. B. Limaye has shown outstanding abilities so as to merit a special mention and worth far more than the position he holds at present.

V. G. GOKHALE,

Deputy Director of Agriculture,

Ratnagiri, 18th July 1925. Konkan Division.

Serial No.	Name of work or the name of the land owner.	Name of taluka.	Name of village.	Diameter of bore.	Depth of boring.	Water before boring in gallons per hour.
	District Thana.					
1.	Mr. Hirasing Dhansing ..	Kelva Mahim.	Palghar ..	5″	127′ 0″	Surface bore.
2	Chitnis Gograss Bhiksha (1st bore).	Thana ..	Dombivali ..	3″	71′ 3″	....
3	Mr. Manik Ramchandra ..	Do. ..	Thana ..	3″	30′ 0″	....
4	Mr. G. G. Dandekar ..	Kelwa Mahim.	Palghar ..	5″	66′ 0″	280
5	Mr. M. A. Dandekar ..	Do. ..	Do. ..	5″	74′ 0″	Surface bore.
6	Mr. Manekji Kawasji ..	Dahanu ..	Gholwad ..	4″	82′ 6″	1,100
7	Mr. D. V. Salve ..	Kelva Mahim.	Saphala ..	4″	76′ 0″	Surface bore.
8	Mr. Nathubhai Haridas ..	Dahanu ..	Gholwad ..	4″	64′ 0″	650
9	Mr. Vasantlal J. Bhat (1st bore).	Kelwa Mahim.	Saphala ..	3″	14′ 0″	250
10	Mr. Vasantlal J. Bhat (2nd bore).	Do. ..	Do. ..	3″	19′ 0″	1,200
11	Mr. V. V. Dandekar ..	Do. ..	Palghar ..	5″	93′ 8″	....
12	Chitnis Gograss Bhiksha (2nd bore).	Thana ..	Dombivali ..	3″	119′ 3″	Surface bore.
13	Mr. G. R. Samant ..	Kelva Mahim.	Saphala ..	3″	63′ 0″	....
14	Chitnis Gograss Bhiksha (3rd bore)	Thana ..	Dombivali ..	3″	18′ 0″	....
15	Mr. Vasantlal J. Bhat (3rd bore).	Kelva Mahim.	Saphala ..	3″	22″ 6″	2,000
16	Mr. H. R. Phatak ..	Do. ..	Do. ..	3″	19′ 0″	....
17	Mr. Cawasji Palanji ..	Dahanu ..	Gholwad ..	4″	74′ 0″	....
	District Kolaba.					
18	The Rice Specialist, Karjat (1st bore).	Karjat ..	Karjat ..	3″	102′ 0″	Surface bore.
19	Do. (2nd bore) ..	Do. ..	Do. ..	3″	50′ 4″	Do.
20	The Superintendent, Rice Breeding Station.	Do. ..	Do. ..	3″	75′ 0″	Do.
21	Mr. Sulleman Valad Allibhai.	Do. ..	Do. ..	3″	64′ 0″	Do.
	District Ratnagiri.					
22	The Medical Officer, Devrukh.	Sangmeshwar	Devrukh ..	3″	33′ 6″	....
23	Mr. P. M. Namjoshi ..	Do. ..	Burbad ..	3″	28′ 0″	....
24	Mr. N. S. Bhave ..	Do. ..	Kalambushi	3″	8′ 0″	....
	District Kanara.					
25	The Superintendent of Police, Kanara.	Honawar ..	Bhatkal ..	3″	70′ 0″	....
26	Do. ..	Do. ..	Do. ..	3″	99′ 9″	Surface bore.
27	Do. ..	Kumta ..	Kumta ..	"	..	....

Water after boring in gallons per hour.	Departmental charges.	Labour charges.	Total cost of boring.	Cost per foot.	Result and remarks.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
2,200	473 8 0	52 8 0	526 0 0	4 2 3	Successful.
....	195 0 0	244 8 0	439 8 0	6 2 10	Unsuccessful.
....	115 0 0	302 8 0	417 8 0	5 3 6	Do.
1,500	212 12 0	60 12 0	273 8 0	4 2 4	Successful.
1,500	240 8 0	146 4 0	386 12 0	5 3 7	Do.
No further supply.	118 8 0	75 12 0	194 4 0	2 5 11	Unsuccessful.
700	248 8 0	48 8 0	297 0 0	3 14 6	Successful.
1,850	202 12 0	76 8 0	279 4 0	4 5 10	Do.
1,200	36 8 0	27 8 0	64 0 0	4 9 2	Do.
2,000	49 4 0	31 8 0	80 12 0	4 4 0	Successful.
....	....	....	....	....	Work on hand.
160	193 5 0	220 8 0	413 13 0	3 7 6	Unsuccessful.
....	....	....	....	....	Work on hand
....	....	....	....	....	Do.
3,000	58 8 0	55 0 0	113 8 0	5 0 9	Successful.
650	50 12 0	38 8 0	89 4 0	4 1 2	Do.
....	....	....	..	....	Work on hand.
980	87 8 0 112 8 0 5 8 0	163 2 0	163 2 0	1 9 7	Successful.
460	87 8 0	113 0 0	200 8 0	2 3 11	Do.
800	152 10 0	212 2 0	364 12 0	4 13 10	Do.
....	67 8 0	199 8 0	267 0 0	4 2 9	Unsuccessful.
....	33 8 0	154 12 0	188 4 0	5 9 11	Abandoned at the request of the well-owner.
50	28 0 0	68 0 0	96 0 0	3 6 10	Do.
....	....	....	....	....	Work on hand.
40	88 12 0	295 0 0	383 12 0	5 7 9	Unsuccessful.
....	115 8 0	370 0 0	485 8 0	4 13 10	Do.
....	....	....	....	....	Work on hand.

APPENDIX H.

ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, SIND, FOR THE YEAR ENDING 1924-25.

Organization and Finance.

1. Mr. T. Gilbert permanent Deputy Director of Agriculture vacated the post on the 4th September 1924 and proceeded on 15 months' leave prior to his premature retirement from Indian Agricultural Service. He was relieved by me and since that date I have been acting in the post-and Mr. Jafarali Ansari acting in my substantive appointment of Divisional Superintendent of Agriculture with Head Quarters at Mirpurkhas.

In the upper subordinate staff Mr. Alimahomed Ulvi Superintendent Sukkur Farm, was deputed to Banga'ore early in February 1925 for the post-graduate course in cattle breeding and Mr. Abdur Rehman reverted to the Department from propaganda work under Khan Bahadur Azimkhan.

2. The sanctioned strength of the Agricultural Department in Sind is :—

One Imperial Officer
Two Provincial Gazetted Officers
Twelve Graduate Fieldmen
Eighteen Non-graduate Fieldmen
Seven clerks.
Five Kamgars, and
Three Mechanical Establishment.
Two Graduate posts are vacant.

3. The cost for 1924-25 was :—

	Rs.	a.	p.
Salaries including travelling allowance ..	90,593	1	0
Contingencies	68,489	10	7
Total ..	1,59,082	11	7
and the receipts credited to the Treasury were ..	54,739	9	7

Season.

4. Inundation.—Normal inundation begins from the end of May and ends towards the close of the month of September. In the season under review however, the river levels continued to be alarmingly low right up to the end of June hence the inundation canals d d not work in time to supply water for Kharif cultivation. Thus the sowings were delayed for nearly a month. But from 1st July onwards the levels began to improve reaching subsequently a point unparallelled in the available history of the river. Attock rose to the record figure of 56′ and Bukkur to 16′-6″.

This high level was maintained for a number of days, with the result that widespread floods were caused in low-lying areas. Villages after villages were washed away and several fields submerged. The floods

subsided with the fall of the river but the submerged areas were not dry till late in the Rabi season.

(*a*) *Rains.*—These were above normal in both Upper and Lower Sind; the latter recording about 14 inches and the former about 5 inches. There was absolutely no rain throughout the whole of the cold weather and as a result bosi wheats were adversely affected.

(*b*) *Frost.*—This was severer and of longer duration, killing outright the oil seed crops in certain areas and injuring the wheat crop, particularly the early ripening varieties.

(*c*) *Insect pests.*—Except a little jowar borer and a cotton boll-worm, these were not conspicuous in the year under report.

(*d*) *Crops.*—Of the kharif crops, cotton could not be sown in time, owing to late inundation. The area under cotton is therefore believed to be below the normal. Early frost damaged this crop very considerably. Jowar and Bajri crops were normal but there was much sterility in the paddy crop.

Sowings of wheat crop were considerably delayed except on high lands as the soil took very long to come into ploughing condition as the result of heavy floods. There was nevertheless a very considerable increase in the bosi cultivation and were it not to the serious damage caused to the crop by repeated spells of frost, the year would have been one of abundant harvest. Oil seeds though presented vigorous growth comparatively produced little grain as result of frost bite. The area under irrigated wheat on the Jamrao and Mithrao canals was practically nil due to the failure of the canals to supply rabi water.

(*e*) *Cattle.*—The condition of cattle was all round satisfactory and there was sufficient fodder available except in East Sind. There was no epidemic outbreak in the cattle worth mentioning.

Health of the people.—Owing to floods and excess of moisture in Mid and North Sind malaria was a more prolonged one than in the previous year.

Prices of the agricultural commodities.—Prices of cotton were below the 1923-24 rates, the highest in the year reaching to Rs. 18 per maund of 84 lbs. As a result of damage by frost to wheat and oil seeds their prices rose by about 10 per cent. of the last year's prices, while rice went up by 20 per cent. as a result of poor outturn due to sterility.

Agricultural labour.—The supply continues to be on the decline. The cost of harvesting and other agricultural operations is consequently growing high day by day.

Research and Investigation—Cotton.

5. Botanical work on this crop consists of:—

(1) the maintenance of pure seed supply of a strain isolated from Deshi cotton and called 27 W. N.;

(2) comparison between each other of the 2 Punjab American varieties introduced by the Department for cultivation in Sind some

years ago as also tests with some of the imported United States varieties ; and

(3) the production by hybridization or otherwise of a variety or varieties superior in staple and at the same time suitable under Sind conditions.

27 W. N. Cotton.—Enough has been said in the previous reports about merits of this strain. It continues to be in favour both with the trade and with the cultivator. Further observations made on this cotton on our farms show :—

(1) that 27 W. N. gives on an average 20 per cent. more outturn than the local Jamrao cotton ;

(2) that this increase in yield is cotributed mainly by first 2 pickings ;

(3) and that it gives 5 to 6 per cent. more ginning outturn than the ordinary local mixture.

These results confirm the previous statements that 27 W.. N. is superior in every respect to the Jamrao deshi. The feature of earliness being of additional value under the present conditions of water supply, the duration of which as a rule has become much shorter than is desirable for a full cotton crop.

6. In these circumstances the demand for seed by the public is growing out of proportion of supply and although our Chellaro seed substation is fulfilling its function to the fullest extent we find that our output of pure seed does not go beyond 2 thousand Bengal maunds. This quantity if most economically used will sow only 4,000 acres whereas the actual demand is 25 to 30 times as much. To reach this stage of supply purely through Departmental agency and by means of Government Fund is too much to expect ; but the want must be supplied. In my opinion the solution lies in the co-operation of growers and trade. The former should co-operate to form an organization whereby they could deliver their produce of the said 4,000 acres in a pure condition to a similar organization of traders who would not only pay reasonable price but would also gin the produce carefully to sell the seed again to the prospective growers.

Under this arrangement an area of about a lac of acres could be secured under our improved strain and this should, of necessity, be the limit up to which both the trade and the grower could possibly follow. Unfortunately there are no co-operative organizations such as suggested above for the present, to successfully tackle this problem and hence the Department took the following steps to approach the above ideal during the year under report.

7. About a 1,000 maunds of seed were given out in a tract with a view to getting a full village or a unit of villages sown entirely with it so as to eliminate any chance of the seed getting mixed up with the ordinary deshi cotton in the field. Agreements were demanded from the recipients of the seed and were executed by some, to the effect that they would sell their produce only to a couple of leading gin owners whose co-operation was secured before-hand to buy up the produce in these villages and to

gin it separately. The object in taking this guarantee was to safeguard against the practice of advance sales which cotton growers commonly make to raise ready cash or to take advantage of high rates which speculators some time offer. In such sales the produce is disposed of in driblets to either petty dealers or to commission agents and as these purchasers generally buy all the lots together whether of deshi or of improved variety, considerable quantity gets separated from the superior produce finally offered for sale. The improved variety is thus either lost altogether or becomes so mixed up that the seed does not remain worth recovering. The year's trial of the scheme has yielded encouraging results but a definite opinion is not possible until it has been worked for at least a year more.

8. The departmental organisation in connection with the maintenance of pure line tradition of 27 W. N. has been described in previous reports. The year's output of self fertilized seed gave 'seed patch' of $1\frac{1}{2}$ acres for current season (1925-26) and the year's 'seed patch' of 6 gunthas yielded seed for an 'increase block' of 3 acres now sown on the Experimental Farm and the year's 'increase block' of $1\frac{1}{2}$ acres has supplied seed for sowing the Seed Farm area known as the 'Field scale plantings'.

9. The outturn of 27 W. N. seed from the Chellaro substation from the first 3 pickings amounted to 1,500 Bengal maunds; the fourth or the last picking being inferior in quality was rejected for seed. Of this quantity of 1,500 maunds, 130 maunds were utilized for sowing on the substation during the current season and the remaining quantity distributed partly under the seed multiplication scheme and partly to co-operative societies.

The Dhoro substation has again shown a net profit of Rs. 12,559-10-8 after paying for the karia clearances and other running expenses.

10. *American Cotton.*—Work on this cotton was continued on the same lines as those reported in the last year's report. Unfortunately the unsatisfactory irrigation conditions on the Jamrao, where this work is confined, greatly hampered the work.

Of the 2 Punjab varieties of American cotton known as F4 and 285F the latter has been found by experiments to give as much outturn as F4 with a slightly low ginning outturn. In the matter of staple however, 285F is superior, having a staple of $\frac{7}{8}$" to 1" as against $\frac{5}{8}$" to $\frac{6}{8}$" of F4 and therefore commands a premium of 1-5-0 on F4 prices.

In the matter of resistance to red leaf blight, both stand equal, and it has now to be seen whether F4 which occupied from 18 to 20 thousand acres on the Jamrao in the year under review will be abandoned in favour of 285F.

11. Further comparative tests between 285F and F4 and the other imported long stapled varieties, *viz.*, Durango. Webber 49-4 Dixie, Cleveland and Mebane show that the first two, *viz.*, 285F and F4 apart from giving

better genmination and better stand give higher outturns. It is therefore a clear indication of the fact that none of the varieties imported from America fits in with the present local conditions of water supply and possibly other environmental conditions. This urgently calls for work in the direction of evolution of a variety possessing all the strong points of F4 or 285F such as prolificness, immunity to red leaf blight, earliness and in addition possessing a staple of 1 inch or above, for the present and the future needs of the country. Unfortunately the present conditions of water supply do not permit of this work being safely taken in hand and we therefore await a better and earlier supply of water on a pumping station which it is hoped will be started from the next year. In the meantime seeds of the imported varieties are being preserved and pure lines raised.

12. Selection work on 285F is being carried out with a view to getting a supply of pure seed from self fertilized material. 285 F cotton as grown in Sind from the seed originally obtained from the Punjab was found to show variation. Strain No. 1 selected out of the several individual plants of this cotton shows an improvement over the 285F ' mass ' in as much as it gives 1-2 per cent. more ginning outturn and is earlier. Besides it has a longer staple by about 1 16″ to $\frac{1}{8}$″. In point of yield, however, both are equal. The strain is being tested further.

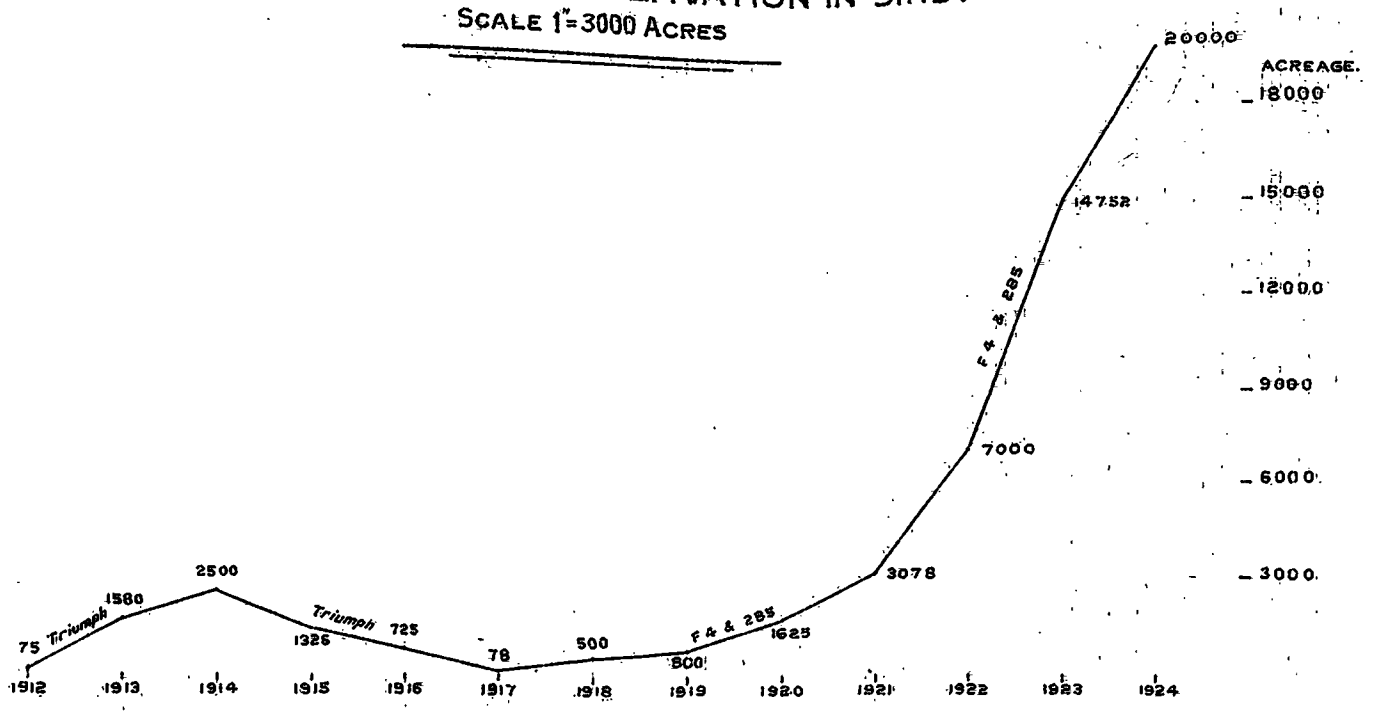
Similarly selection work on F4 is in progress. Four selected plants from this cotton are being maintained as separate lines to keep up the pure line traditions.

13. The results of the trials of small quantities of 285F and 289F seed received from the Economic Botanist Lyallpur point to the imported seed giving lower ginning percentage than the crop grown from home grown seed. This phenomenon is being investigated into ; in the meantime I am calling for figures of ginning outturns of 285F and 289F as obtained in the Punjab itself.

Results of the trials of the various other imported strains together with the results of their comparison with each other as also the detailed observation on staple, ginning outturn, flowering period, etc., as studied by Mr. Thadhani have been dealt with by him in a detailed report. They are however not recorded here being mostly of acedemic value.

14. Position with regard to supply of American seed for district use is, that, beyond growing 24 acres on the Seed Farm we depend partly on the importation from the Punjab and partly on the supply from Local Firms. The Local Firms buy cotton certified by the Department to be reasonably pure, store and gin it separately from the other uncertified stuff. Experience shows that the seed obtained from Firms is generally adulterated and imported seed is botanically impure. This points to an immediate departmental organization for the production of seed up to a certain stage and now that we have self fertilized material available we hope to proceed with its large scale multiplication on the basis of 27 W. N. seed organization provided early water supply is available.

GRAPH
SHOWING
AMERICAN COTTON CULTIVATION IN SIND.
SCALE 1"=3000 ACRES



15. The seed for 1924-25 crop was supplied from the sources as shown in the margin. The year under review was one of disappointment for F4 cotton as it was quoted even less than local cotton for some weeks and later on, premium ranged between 2 to 12 annas only per maund of seed cotton. The buyers' explanation about this state of affairs was that the demand for this type of cotton had temporarily ceased on the continent and as prices for Desi went suddenly up F 4 could not for the time being compete with it. This phase of market led to the majority of growers mixing their American with Desi and then presenting the mixture either as American or as Desi according to the condition of the market. 285 F on the other hand fetched a premium of Rs. 1-12-0 and commanded ready sale. This led to increased demand for the latter seed which had to be complied with as per figures noted in the margin above. It is not however a sound policy to handle two types simultaneously and I am watching the current year's developments with a view to deciding as to which of the two varieties should ultimately be retained for district cultivation.

	285 F.	F 4.
	Mds.	Mds.
Imported ..	2,500	..
Locally purchased from Firms and distributed ..	*Nil.*	500
Supplied direct by firms ..	806	1,997
Total ..	3,306	2,497

Wheats.

16. Of about 2 million acres of wheat in the British districts of the Bombay Presidency, Sind shares about half a million acres but judged by the outturn, Sind figures come up to very nearly the half of the total crop, *viz.*, 2 lakhs out of 5 lakhs of tons. Hence wheat is one of the most important crops in Sind.

The departmental work on this crop consists of (1) trial and introduction of some of the best wheats grown in the other parts of India, *viz.*, Pusa 12 and Punjab 11 and (2) isolation of improved strains of important Sind varieties.

As a rule wheat field in Sind consists of a number of different types of plants with one or two types predominating. Some 17 such types have been found to exist which have been classified and the improved strains of the more important varieties, *viz.*, Phundani and Thoree (awnless) for Upper Sind and bearded varieties for South and East Sind isolated. Of the several strains thus isolated from the above varieties only the most promising ones have now been finally retained after submitting each to severe tests. These are C. Ph. 47 from Phundani, A.T. 38 from Thoree, and G.S. 24 and G.S. 25 from the bearded wheats of Lower Sind.

These are being compared with Pusa 12 and Punjab 11 wheats. The last two form largely the basis of our seed distribution. Thus the selected strain of Thoree and Phundani were grown during the year under report in comparison, for the second time, with Pusa 12 on the Sukkur and Larkana Farms under irrigation.

17. Results of yield of strain A.T. 38 from nine replications, each measuring a 100′ length of rows, showed at both the farms increase in yield amounting to 16 per cent. and 14 per cent. respectively over Pusa 12. Similarly strain C.Ph. 47 gave an increase of 6 per cent. at Sukkur and 30 per cent. at Larkana. The results so far as they go may be regarded as satisfactory but a confirmation of them seems desirable in view of the fact that last year's tests did not show any difference between the yields of these strains and Pusa 12. It may also be borne in mind that Pusa 12 being an earlier ripener had sustained much more injury from long spells of late frosts than our selected strains of local wheats.

18. On the Bosi area on the Jacobabad Farm experiments point to strain B.T. 36 (Thoree strain for Bosi cultivation) giving higher yield in 18 replications out of 21, than Pusa 12 by 10 per cent. but the ratio of difference to error suggests that the confirmation of results by further test is necessary. Similarly the difference in the outturn of C.Ph. 47 and Pusa 12 in 10 replications was 51 per cent. in favour of the former, beyond the limit of probable error; but in both the above tests Pusa 12 was at a greater disadvantage than our selected strains in being an earlier ripener and consequently suffering from the effects of late and repeated spells of frost to a greater degree.

In another experiment designed to compare Phundani strain with Thoree strain the difference in yield is far too insignificant to enable an opinion to be given in favour of any. Obviously the demand exists for both as separate varieties and both must therefore remain in a state of purity.

19. One of the serious defects of Pusa 12 that the seasonal conditions have brought to the front for the second time in its history is its producing flowers at a time when frost is likely to occur. In a normal season earliness is one of the most welcome qualities that it possesses but in seasons of late frost as was the case in the season under review when spells were of longer duration than the spells of 1919, this wheat being in flower suffered more than the other local wheats. Experience of 1919 suggested the delaying of its sowing till the mid of November so that it should flower after the danger of frost in February had passed. This was duly followed but the experience of the present season points to the desirability of further delaying the date of sowing of this wheat and I am consequently arranging experiments to find out, how far we could delay sowing without affecting the grain yield.

Comparative tests between the selected strains of awned wheats, *viz.*, G.S. 25 and G.S. 24 with the Punjab 11 in East Sind (Mirpurkhas) have yielded some useful data and these have been duly recorded. They are not mentioned in this report; because they require further confirmation.

20. Work in connection with the maintenance of self-fertilized seed of Pusa 12 and its multiplication on the Wheat Farm is being continued and this is essential for the supply of pure seed.

Wheat Farm, Jacobabad, continues as usual producing wheat seed on large scale for distribution. 58 acres 29 gunthas were put under Pusa 12,

our main variety, and 2 acres under our three improved strains. The amount of seed available for sale in 1925 has not yet been weighed.

Rice.

21. Botanical work on Rice on the Larkana Farm is in the form of improving by selection the three important varieties out of a number in cultivation in North of Sind. This is in progress for the last three years. Of the several strains selected from each variety only 10 of each were retained from the last year's crop with one as "standard". This number was further reduced to 5 in the year under report with another as a standard. In the results of the tests recorded by Mr. Thadhani, Kangni strain 27 show an increase of 6·3 per cent. over the standard (also selected). In the case of Jajai, strains Nos. 77 and 43 have yielded 10·3 per cent. and 10·2 per cent. respectively over the standard and an increase of 61·9 per cent. by Prong 36 and 7·4 per cent. by Prong 51 have been recorded. These increased yields of the several strains even over "Standards" clearly demonstrate their superiority over the existing mass varieties.

In the matter of earliness there was no further progress beyond what had been attained in the preceding year in the case of Kangni and Jajai strains, but Prong strain No. 51 was much earlier than the remaining four strains and also "Standard".

Biometric study of various characters of agricultural and economic importance was made on the selected strains of Jajai, Kangni and Prong as also on other Sind varieties and the results have been duly recorded.

22. In comparative tests of the two prominent outside varieties, *viz.*, Kolumbia strain 79 (Karjat) and Dadkani (Bengal) with the local ones, a Kangni strain gave an increased outturn of 15·9 per cent. over Karjat while Dadkani beat Jajai and Prong by 9·4 per cent. and 23 per cent. respectively. The factors of earliness were almost equal. Both Karjat and Dadkani are fine rices and have extra small grain. Of the 37 miscellaneous varieties grown for study, 24 were from Sind, 6 were new types and 7 were foreign varieties. Observations were taken on each variety with reference to the following points :—

Fertilization.
Range of earliness in a single variety.
Range of earliness in a single plant.
Yielding capacity.
Biometric study of the various characters.

These have been duly recorded and the broad conclusions arrived at are, that Sathri, Ganjro, Torh, and Motiaro (Sind varieties) are very high yielding. The first two are early, the last two medium ripening varieties.

The six new types discovered from experimental fields some two years ago continue to maintain most of their original characteristics thus proving each to be a distinct variety. Their classification and further study may lead to their introduction as additional varieties or substitutes for the existing inferior kinds.

23. In the foreign varieties Kolumba 42, a fine white grained but late variety, gave promising results and will be tested further in comparison with the late local varieties. Dadkani (Bengal) and Kolumbia 79 (Karjat) have further proved their superiority over some of the best local varieties (*vide* para. 22 above).

Further study of the natural course of rice fertilization confirms the previous observations recorded in the last year's report except that the opening period of flowers became greater by a couple of hours from the end of September to the first half of November.

24. Work on the selected strains from each of the three most important varieties of local paddy, *viz.*, Kangni, Jajai and Prong, has now reached the stage of testing them under district conditions. This has been duly done by giving out 45 maunds of Kangni strain, 41 maunds of Jajai strain and 20 maunds of Prong strain among 12 growers in the current year. Organization of seed production on large scale will depend upon the results of district trials.

Other work on rice deals with the problems of—

(1) Best seed rate per acre.
(2) Best date of transplanting.
(3) Rab material.
(4) Dry ploughing *versus* puddling of rice lands.

Extended work on the first two problems though cannot be said to have assumed definite shape owing to varying conditions of water supply has nevertheless shown that 20 lbs. per acre is the best seed rate as against 104 lbs. used by cultivators and that seedlings transplanted in June give an increased yield of 50 per cent. over the crop transplanted after first week of July.

Rab Experiment.

25. This experiment has now been in progress for a sufficient number of years to admit of definite conclusions being drawn. Of the several substitutes for the usual cowdung, tested as Rab Material, *viz.*, (*a*) Drub grass, (*b*) Rice husk, (*c*) Sulphate of ammonia and (*d*) castor cake either in combination of two or individually, the sulphate of ammonia with drub grass as burning material has been found to be the cheapest and most effective substitute. This result is of a special value when we consider the cost and trouble involved in procuring cowdung or the rice husk, the latter now being extensively used as fuel for the Rice 'Josh' industry. From the figures of cost of each material worked out it appears that sulphate of ammonia apart from being cheaper than any other by nearly 50 per cent. gives much stronger seedlings resulting in better crop.

A leaflet is in the course of preparation to record the result of this experiment.

26. Further comparative trials of ploughing rice lands in dry condition *versus* local puddling method made in the year, have resulted in an

increased outturn by 20 per cent. in favour of the former. As a result of this and the past demonstrations our method of dry ploughing is being largely followed by the zemindars and it is now a rule with them not to give out land to the Harri who would not consent to plough the land in fair weather.

Other Crops.

27. Of the crops, other than those described above, Jowar is being submitted to detailed botanical study by the Larkana Farm Superintendent and various methods for the production of Berseem seed are under trial with a view to getting increased seed outturn of high quality.

Several improved varieties of gram evolved by Mr. Howard are under trial in comparison with the local types.

Preliminary work on Jowar is in the shape of classifying the existing types in Sind of which there are about 56 in number. These are being studied with reference to the density of their ear-heads grouped as compact, medium, and loose. The other character called in aid for classification is the length of the head and we distinguish long, intermediate, and short. Grain classification under each group of ear-head is studied with reference to its colour and shape whether white, yellow, or red and oval or flat. Selfed seed of each type is secured every year by bagging the ear-heads and our work in this connection has sufficiently advanced to enable us very shortly to fix the very best types for general cultivation.

Further observations in connection with Berseem production confirm the view that a couple of cuttings of green fodder may be taken before leaving the crop to seed without prejudicing the outturn and that a crop intended for seed should be sown timely, *i.e.*, not later than mid-October. Under these conditions the seed production ranges round 4 maunds per acre. In a year of prolonged spells of late frost as was the case in the year under review, berseem growth was found to have been considerably checked and this was reflected in the seed yield which is estimated to have fallen down appreciably.

In the matter of gram, the three Pusa varieties were under further tests. The crop was however hard hit by the uprecedented spells of frost and hence the result can hardly be relied upon. Type No. 6 has proved to be a late variety but this seems to be an advantage rather than disadvantage under Jacobabad conditions inasmuch as it supplies green feed to cattle during April and May when other varieties dry down.

Fruit.

28. The work on fruit is being continued, on a small scale on the Mirpurkhas Experimental Farm. The adverse irrigational conditions here have not allowed the economic aspect of the problem being fully worked out but under the reorganization scheme which provides for two big wells it is hoped that it will be possible to put the work on sound basis.

The present work consists of the growing and comparison of the several varieties of vines, citrus family and mangoes. Results show that from the point of prolificness and flavour Nagpur orange is the best and that Sylhet commonly known as "Mosumbi" is the next best. The highest number of fruit borne by Nagpur orange tree was 911 and the average per tree calculated from half acre orchard amounts to 236. A variety of orange called "Royal George Navel," though flowers copiously, does not set fruit and this experience seems to be in agreement with the results obtained in the Presidency with this variety. Of the pomelo variety the "March" imported from Saharanpur does not compare favourably with the common red fleshed variety both in size and in flavour. "Bedana" and large white fleshed variety has not yet fruited. Study of a large collection of limes with the object of finding out the best stock for budding and grafting oranges upon, show that Karna, Jamburi, Sharbati and Katharia are most suitable and that in the matter of fruit 'kagzi' round and long are the most prolific and remain in bearing practically the whole of year.

Of the varieties of vines, Motia (white) has proved superior in quality to Gulabi (rose) but is a shy yielder.

Varieties of Bombay grafted mangoes imported some years ago continue to give satisfaction. Hapoos, Cluster and Khasa have proved to be the best of the lot.

In the year under report the canal worked so badly as to supply no water for 4-5 months continuously and hence grapes failed to fruit and mangoes realized only Rs. 200.

The number of cuttings and young plants supplied to the public amounted to 1,063 plants and 412 cuttings worth Rs. 411-4-0.

Implement and Machinery.

29. The greatest need of the province is an efficient plough but such a plough should, apart from being within the means of an average cultivator, be such as to be easily pulled by an average pair of bullocks. A beginning made in this direction some years ago led to the introduction of a type called Egyptian plough. This was readily accepted by the people and in course of time it became so popular that there are now areas in which none but this plough is in use. Since then several minor changes have been effected in the original type according to the experience gained from time to time and accordingly it has assumed quite a distinct type of its own.

Under these circumstances and with a view to fit in its name with that by which it is popularly known I have decided to henceforth call it as "Sircar" plough.

The yearly sale of this continues to be over 3,000.

A step forward in the same direction resulted in the testing of several types of iron ploughs from heavy down to light ones and I have recently drawn up a list of those, whether in their original or the slightly modified form, which I consider by experience to suit cultivators' purse and cattle.

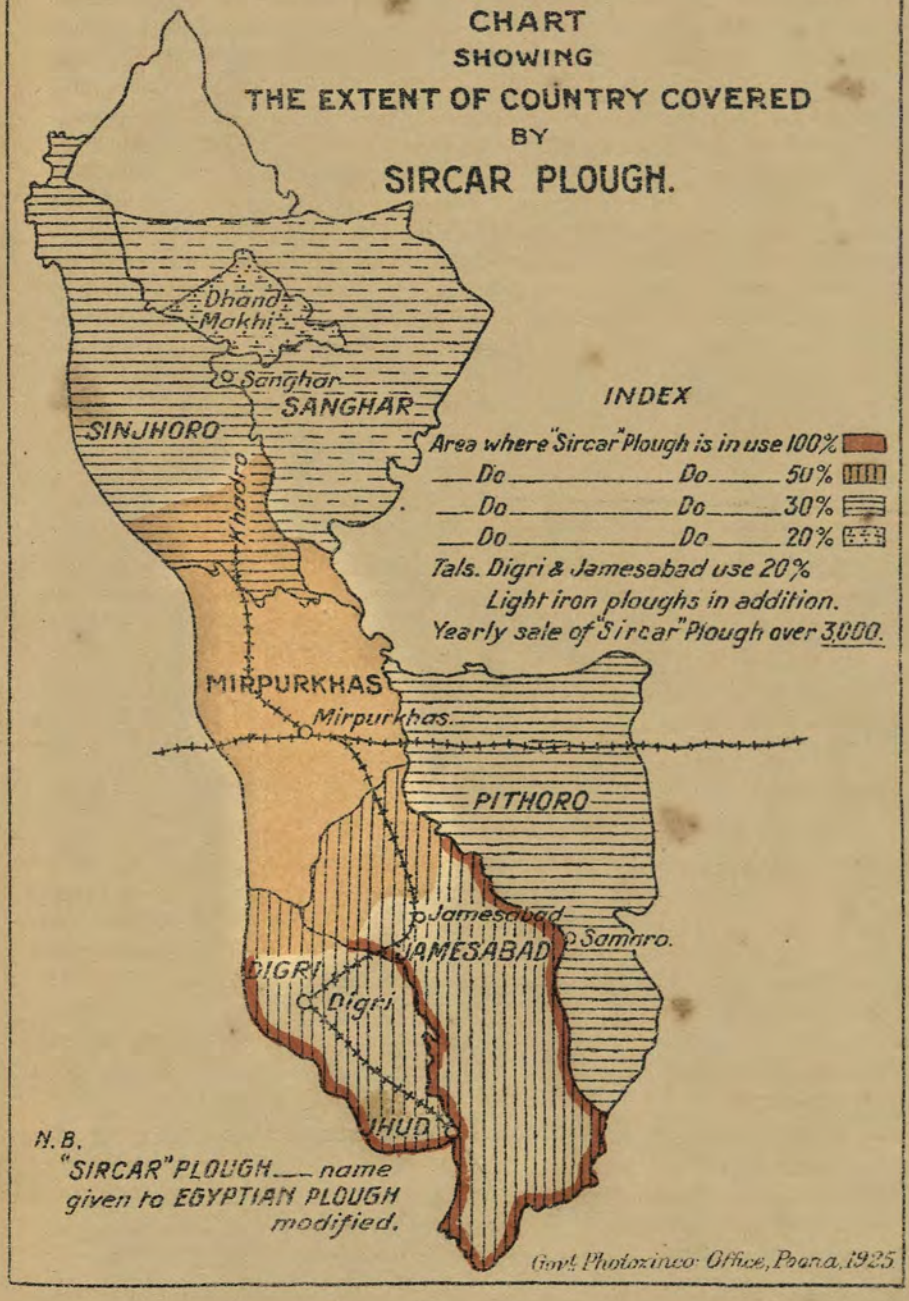


CHART
SHOWING
THE EXTENT OF COUNTRY COVERED
BY
SIRCAR PLOUGH.
Dhand Makhi
Sanghar
SANGHAR
SINJHORO
Khadro
INDEX
Area where "Sircar" Plough is in use 100%
Do Do 50%
Do Do 30%
Do Do 20%
Tals. Digri & Jamesabad use 20%
Light iron ploughs in addition.
Yearly sale of "Sircar" Plough over 3,000.
MIRPURKHAS
Mirpurkhas
PITHORO
Jamesabad
JAMESABAD
Samaro
DIGRI
Digri
JHUD
N.B.
"SIRCAR" PLOUGH — name given to EGYPTIAN PLOUGH modified.
Govt. Photozinco Office, Poona, 1925

These are :—

	Price. Rs.	a.	p.
The Meston plough	11	0	0
Chatonooga No. 32	27	0	0
Sirdar plough	22	0	0

Thus our propaganda staff will for the present push the sale of only these till we have come out with other types the study of which is in progress on some of our farms. Orient plough manufactured by Messrs. Ransomes Sims and Jeffries is one of the most promising ploughs but the current price of this plough is Rs. 32. It is essential to reduce this price before its general introduction becomes possible. Mr. Schutte, Agricultural Engineer, is now working upon a design of a similar plough which he anticipates can be made in India with the same general excellence of the original type at Rs. 15.

30. After the plough, the implements which have brilliant future are the Cambridge and self-cleaning Nicholson Rollers. Messrs. Howard of Bedford who designed a special size of the Cambridge roller for Sind a few years ago to enable an average pair of bullocks to pull it and supplied it for Rs. 300, were again approached by me for still further reduction in price. To this they agreed and I accordingly sent an order for six. On arrival of the first consignment of three I however found that instead of the notched rings as in the original type they put spiked rings rendering the machine far less effective in breaking clods. I have therefore cancelled my order for the remaining three and have now put myself in communication with the proprietors of Implement Factories at Satara Road and Kirloskervadi through the Director of Agriculture with a view to getting this and the self-cleaning Nicholson roller together with the Norag thresher and Iron leveller cheapened without impairing their original excellence.

31. In the matter of Mechanical cultivation Cletrac tractor continues giving satisfaction on the Jacobabad Farm under the careful control of Mr. Barakzai, the Farm Superintendent.

Running expenditure for various operations done by the tractor as worked out by him stands as under :—

	Rs.	a.	p.
(1) Ploughing with two furrow 14″ mould board plough in the Jacobabad soils per acre including overhead charges of Rs. 2-6-8	5	14	3
(2) Reaping with Omnimum self-rake reaping machine per acre	2	5	3
(3) Threshing with De'Pole thresher per one maund of clean grain	0	3	1
(4) Pumping with 5″ to 7″ watering per acre ..	6	7	9
(5) Chaff-cutting (per 100 lbs. Kadbi)	0	2	2

These figures show that the performances of the tractor except at the draw bar, are from the point of cost uneconomical. The pulley work when done by an oil engine burning crude oil instead of the high class

kerosine oil as used for the tractor as also the low initial capital outlay together with its 2½ times longer life will bring the cost to about half of what has been shown for the items of pulley work performed by the tractor.

32. Regarding the new type of winnowing machine specially designed by Messrs. Penny and Porter of Lincoln for separating Jowar grain from Bhusa received three years ago, the addition of a countershaft with suitable pulleys to increase the speed of the fan seems to have remedied its original defect of delivering grain with a large amount of Bhusa mixed with it. The Bhusa under this arrangement blows off clean and the grain falls to the ground in a cleaner state than used to be the case. The Agricultural Engineer now expects to have this modified machine made in India within Rs. 150 and if he succeeds I anticipate a very great demand for it.

Figures worked out in connection with the six-coultered Hoosier drill show that 6 acres can be sown with it in a day at a cost of annas 8 per acre as against Rs. 1-10-0 by the local method of sowing with one-coultered drill. The drill can be worked by a pair of bullocks but it has been found convenient to use two pairs, one working in the morning and the other in the afternoon.

Unfortunately the high price of the drill (Rs. 500) is coming in the way of its general introduction but I expect that something will soon be done to have an imitation of it made in India at a cheaper price.

Other machinery under trial on the Jacobabad Farm are De'Pole Wheat Threshing machine purchased from Holland and the Omnimum self-rake reaper manufactured by Messrs. Samuelson & Co. of England. These were for the first time tested during the year under review. The tests are however not yet complete and I am therefore reserving my opinion upon them for the next report.

Dairy Herd.

33. The strength of the dairy herd at Sukkur Farm was seventeen buffaloes of which sixteen were in milk. In addition to this number there were two heifers in calf, thirty young stock and one bull. Two cows were sold during the year, fourteen calves were born of which four were sold off.

Fifteen of the young stock are kept on the Larkana Farm. The number in milk ranged from ten to sixteen and the yield of milk was 59,224 lbs.

The best cow gave 4,659 lbs. in 300 days as against 6,476 lbs. of last year's best milker. This low yield was due to the whole herd having been attacked by the sickness called " 3-day sickness " which prostrated them for nearly a month.

We have now a couple of premium bulls ready here to give out to the public and negotiations in this connection are going on with certain bodies in North Sind.

Agricultural Education.

34. Agriculture is being introduced in the Upper Standards of a few primary schools in Sind. The number started so far is one in Upper

Sind Frontier District, one in Larkana District, one in Sukkur District and one in Nawabshah District. Classes in Hyderabad, Karachi and Thar Parkar districts are in the course of introduction. The agricultural teachers for these schools have been given practical training on our farms and the schools are inspected from time to time by the Agricultural staff for giving expert advice at the request of the Educational Department.

Rat pest Investigation.

35. Probably there is no other animal so mischievious and destructive to crops as the field rat. Sometimes the damage done by them to paddy assumes such enormous proportions that wholesale remissions of land revenue have to be given. For instance in the year 1920-21 in Shahbunder Taluka the remissions amounted to Rs. 17,947-13-0 and in the year 1917-18 in Mirpur Bathoro to Rs. 24,703-14-0. The departmental investigations on this serious problem conducted in the year under review were in the following directions :—

(1) Identification of the species of the rat and ascertaining its life History.

(2) Observations of its social, breeding, dwelling and other habits.

(3) Nature and extent of damage done by them.

(4) Trials of various methods of control.

(5) Determination of suitability of various poisons, their doses and their media.

Rice is the only crop which suffers the most and damage is done to the crop at three stages of its growth. First when the crop is 1½′ to 2′ high the rat cuts the plant at the succulent portion of the stem, and such damage covers several patches of the field. The plants thus cut however give out new shoots which mature their earheads and the loss is not much. The second stage is when the earheads develop milk inside. Rats go up the plant and suck the milk from the grain which never again develops. This loss is very heavy in some years. The third stage when the crop is fully ripe, the rat cuts the heads and stores it in the burrows. More than 600 earheads have been counted in some of the burrows when the work of collection was still in progress. It is said that in years of severe rat infestation the rats move from field to field actually harvesting the crop at night.

Trial of methods of control :—Hand digging is the method locally practised but is very costly. One man can dig and destroy from 15 to 20 rats in a day and is paid at the rate of 2 to 3 pice per rat. Snakes, jackals, wild cats and trained dogs to some extent kill the rats but none of these enemies effectively keep the pest under control. The departmental remedial measures were conducted on two lines, *viz.*, poisoning and fumigations. *Traps* as are used in case of house rats were discarded because no bait that could attract rats in sufficient number could be found.

36. The common *rat poisons, viz.*, Strychnine Hydrochloride, Barium Carbonate, White Arsenic, Copper Sulphate, and Vermin Destroyer were

tried and administered through the media of cooked rice flour, cooked wheat bran, and uncooked rice flour, and in different doses and the result is, that, of all these poisons Strychnine hydrochloride has been found to be the best and the quickest acting 0·025 grain being sufficient to kill the rat within 30 minutes. Another point elucidated from the experiments is that the addition of flavouring substances like gul, cocoanut oil, and aniseed oil instead of accelerating the rush for the bait deteriorate the value of the bait.

37. *Fumigation* on the other hand has given very promising results. Carbon bisulphide and petrol were used as fumigants and the fumes were pumped in the burrows by means of a machine called the 'Suddeth Rabbit Fumigator' imported from Australia. The results achieved show that Carbon bisulphide is a very useful fumigant and only ½ minute's pumping is sufficient to destroy the rats one and all. The best time for using this method is from July to October when the rats are all confined to the embankments and the burrows are very short.

Co-operation among the zemindars is very necessary for the wholesale cleaning of the pest from a tract. If only a few people resort to these means and their neighbours neglect, the rats from the untreated area will travel and reinfest the treated area. Legislation seems to be perhaps the only way of getting out of this difficulty.

The programme of the current year consists of further observations on all the points mentioned above for confirmation and for obtaining further data if possible. Extensive trials will moreover be given to poisoning and fumigating methods and some new poisons such as sulphur and Hydrocyanic acid will be tested. A separate block of field will be selected for fumigation treatment with a view to working out cost and the economy.

Propaganda.

38. Position with regard to propaganda work in Sind is that the following 8 talukas have been assigned to the Assistant Registrar Co-operative Societies, Sind, from January 1923 for carrying out intensive agricultural propaganda.

Hyderabad, Halla, Shahdadpur, Tando, Allahyar, Sukkur, Ghotki. Kamber and Larkana.

Propaganda work whether extensive or intensive in the rest of the province is dealt with directly by the Agricultural Department. Intensive work is confined to 3 talukas of Thar Parkar District, *viz.*, Mirpurkhas, Jamesabad and Digri but a proposal is being placed before the Divisional Board for the extension of the intensive work in the adjoining talukas of Sinjhoro and Guni. This move has been made possible by the starting of Taluka Development Associations which will be competent enough to handle the work, solidly established as it has been by sustained efforts of the Department for the past 10 years. Proposals are also afoot to take up Jacobabad and Nawabshah for replacing the present extensive by intensive work.

39. The chief material of propaganda are, seeds, implements and improved methods of cultivation. The seeds handled are improved strains of desi named as 27 W. N. and American cotton. The merits of these seeds have been described in paragraphs 5, 6, 10 and 11 above.

Owing to chronic difficulty of cold weather water supply, wheat cultivation has been almost entirely suspended on the Jamrao but the Department distributed some 50 Bengal maunds in a couple of village and also distributed some selected strains and varieties in Badin (District Hyderabad) all of which were highly appreciated.

The variety of wheat which has met with most popularity on the Jamrao is Punjab 11.

40. The total quantity of 27 W. N. seed distributed by the Divisional Superintendent of Agricultural East Sind in the year under review was 918 maunds and that distributed in the current year amounts to 1,363-20.

These quantities were only sufficient to meet a very small fraction of the demand. The premium received by the growers of this cotton over the ordinary local ranged between 4 to 14 annas.

41. *American cotton.*—The quantity of seed distributed in the year under report was 4,000 maunds imported from the Punjab and 80 maunds produced on the Seed Farm. In addition to this a large quantity of seed was supplied by the local Firms. The variety was F—4. Figures of area under American cotton kindly supplied by the irrigation department show that these were between eighteen to twenty thousand acres under it. This is the highest area ever reached under exotic cotton since the Department began its operations and shows how very keen the people are on this cotton even in years when water supply is not available at the proper sowing time which is March-April. A copy of the accompanying chart will show how very steadily the cultivation has gone up. Future development of this cotton will depend upon the state of water and the seed supply. A scheme in connection with the production of seed locally has been discussed in paragraph 14 above but it must be noted that success of the scheme will largely depend upon the factor of early water supply.

42. *Implements.*—The most popular ploughs in the intensive area are the "Sircar" and the Meston plough. Efforts of the Department in training the local misteries have led to a large number of these ploughs being now manufactured in several villages and sold direct to cultivators. Their annual output is estimated to be several hundreds. The use of Meston ploughs is at present confined to Jamesabad Taluka but steps are being taken to introduce them in the other intensive talukas.

The implements sold direct by the department are shown in the margin. Orders from the talukas under extensive propaganda were transmitted to the local manufacturers for direct compliance. The accompanying chart will show the extent of the country covered by the "Sircar" plough.

Meston ploughs	..	304
Rajah ploughs	..	3
Chaff cutters	..	4
Cambridge roller	..	1
Iron water wheels	..	13

43. In the improved methods of cultivation, we had our usual demonstrations of sowing of cotton in lines. The area operated upon was 263 acres in Mirpurkhas, Digri and Jamesabad talukas. This was considerably below the original programme and was due to the late arrival of water in the canals which necessitated the sowing operations being done hurriedly. Hence many zemindars had to fall back upon broadcast system although they would have liked to sow by the line method. The drilled crops presented vigorous growth and were the outstanding demonstration of how costly hand weedings could be done away with, in a drilled crop, by making intercultivation possible by means of bullock power.

The small substation at Jamesabad for demonstration of cotton and wheat varieties and implements was successfully run by the Divisional Superintendent of Agriculture. It gave a net profit of Rs. 670 4-3.

The usual village to village demonstrations with implements were carried out in 6 villages but the work was checked in the middle by the staff falling sick from the effect of malaria.

44. Implement and Tractor demonstrations held after several years at Mirpurkhas and Jacobabad in which 2 private firms participated were very successful. The tractor demonstration was the first of its kind. The people and the press commented very favourably upon them and the marginally noted orders for seeds and implements were registered.

	Maunds
27 W. N. ..	73 ,,
F 4 ..	10 ,,
285 F ..	10 ,,
Eagle Hand Saw gins	2
Howard Cambridge Rollers ..	2
Nichalson Rollers	6

As a result of these demonstrations. His Highness the Mir of Khairpur whose representatives were present at the show purchased one 'International' tractor and also invited the department to hold a demonstration at his capital on similar lines. The request was complied with. A number of sample ploughs were purchased by the Durbar for getting them made locally and they also placed an order for a Hoosier drill costing Rs. 500.

A similar move was subsequently made by the zemindars' Association of Tando (District Hyderabad) inviting the department to organize a small show at Tando Mahomedkhan. This was duly done. There was a very large attendance of zemindars and cultivators at the show and impression created by the successful working of our implements, was very favourable.

Miscellaneous.

45. Of the other manifold activities, the organization of Taluka Development Associations and the beginning of preliminary work at Sakrand in connection with the reorganization scheme are worth mentioning. 3 such associations have been started in the intensive talukas with subscriptions noted in the margin. These have been duly registered by the Registrar, Co-operative Societies, Bombay. Programme of work to be undertaken by each association together with their budget estimates have been drawn up for submission to the Divisional Board.

Mirpurkhas ..	1,750
Digri ..	697
Jamesabad ..	1,436

The Divisional Board of Agriculture held three sessions during the year two at Karachi and one at Hyderabad.

Preliminary survey of the Sakrand land was done by Mr. Abdur Rehman for the purpose of canalization who also attended to several other minor items in connection therewith.

The Mechanical Assistant with his fitter attended as usual to the Farm Machinery and other Departmental calls and erected two new pumping plants on zemindari holdings beside attending to ten enquiries from the public.

All the staff and office establishment worked satisfactorily.

GUL MUHAMMAD ABDUR REHMAN,

Acting Deputy Director of Agriculture, Sind.

APPENDIX I.

WORK DONE UNDER THE PROFESSOR OF AGRICULTURE DURING THE YEAR ENDING 30TH JUNE 1925.

Charges.—Mr. V. G. Gokhale, L.Ag., Deputy Director of Agriculture, Konkan, acted as Professor of Agriculture during my transfer as Live Stock Expert to the Government from July 1st to November 10th when I relieved him of the charge.

Nature of work.—The mainwork under me is the teaching of Agriculture and Dairying. From June 1925 the college course is overhauled to give greater facilities for teaching practical side of Agriculture. The new course will materially increase the hours of work for my section as it introduces field work in the first year and adds crop optional in the final year. It is felt that one more senior assistant at least will be badly needed to handle these additional practical classes.

Besides being the teaching centres, the college farm and the dairy serve as centres for demonstrating to a large number of visitors, improved methods of crop production, the use of improved implements, the proper methods of handling live stock, etc., and for stocking improved implements and various seeds for sale.

Research is another branch of work which is not neglected; during the year under report an amount of preliminary work has been gone through in connection with the investigations into "Economics of tillage and implements" with the help of a special assistant from Sir Sassoon David Fund. The experience gained has been of great use in formulating the scheme of work for 1925-26. It may be noted however, that research in tillage and its effects on soil and crop growth is a subject which is very complex and presents many inherent difficulties. It is however hoped that the revised scheme based on the experience of the year under report would considerably help the study of the whole problem of tillage and implements.

Mr. H. M. Desai, B.Ag., has been studying for the last two years the important question of a suitable method of growing turmeric successfully in Deccan soils. The ordinary bed-method practised in Gujerath is not so suitable for the black soils here. The ridge and furrow method of Satara can be improved. As a result of this work it has been found that what may be called the "Broad ridge method" is probably the best for Deccan soil conditions. In this method the water is given in channels five feet apart and is allowed to be absorbed by capillarity by the soil (broad ridge) in between the two water channels. The soil on the ridge remains in excellent tilth. Rhyzomes grow very vigorously and a very large increase in outturn is obtained (*vide* statement further). If this method is followed it would mean a great advantage to the farmer in Deccan.

On the Dairy farm very valuable data on the methods of growing maximum fodder crops with minimum of expenses are being collected.

Besides, very valuable data on commercial management of a dairy farm are being collected which would be certainly very useful towards the solution of the problem of milk supply.

The Agricultural College Farm.—The total area of the farm is about 275 acres of which about 125 acres are cultivable, of which about 12 acres are set apart for the use of various Expert Officers at the College. The rest is utilised for teaching purposes and for growing fodder crops to supply fodder to a large number of bullocks maintained for teaching purposes.

Season and its effects on Crops.—The sowing of crop was delayed up to 28th July. Towards the middle of August all Kharif crops suffered from drought. But the rain in the last week of August was timely. There was again useful rain in the last week of September.

In addition to unfavourable rainfall we had the frost which had very serious effects on many crops. The minimum temperature suddenly dropped from 44°F on 21st to 35°F on 22nd of January and we had partial frost. On 23rd and 24th January the temperature came down to 33·5°F and the work of the frost was complete.

Crops of cotton (neglectum and herbaceum varieties) and tomatoes, that were still in blossom were completely lost.

Rabi jowar suffered in a strip more exposed to a cold wave from north east and the yield was reduced by about 50 per cent. In Rabi brinjals the upper $\frac{1}{3}$ or $\frac{1}{2}$ of the leafy growth was affected, which after pruning and irrigation produced a good crop. Chillies suffered in the last picking. Turmeric leaves were parched up but no effect was noticed on the Rhyzomes.

Crops like lucerne, cabbage, onions, wheat, peas, did not suffer in any way. Pan (Betel leaves) garden which was well protected on all sides by wind-break showed no effect of frost.

Insect pests and diseases.—Thrips on onions, leaf curls on chillies in one part of the farm, leaf caterpillars on jower and rust on wheat were the chief plant enemies.

Some noteworthy features of this year's cropping.

Crop.	Area Gunthas.	Outturn per acre in lbs.	Net profit per acre.
Turmeric—			Rs. a. p.
Bed method ..	10	13,512 (green) ..	120 3 6
Ridge „ ..	5	21,832 („) ..	510 11 6
Broad ridge ..	10	24,536 („) ..	620 12 9
Suran— ..	40	37,380 („) ..	559 6 0
Double beans ..	10	7,448 Pods 336 seeds 7,296 fodder ..	424 13 0
Cucurbits ..	10	20,720 ..	465 8 0
Onions for seeds ..	20	717 lbs. seeds 5,422 „ bulbs ..	613 3 6

Crop.	Area Gunthas.	Outturn per acre in lbs.	Net profit per acre.
			Rs. a. p.
Bhendi and Guwar ..	10	5,472 lbs Bhendi 1,812 „ Gowar 154 „ Coriander	92 15 0
Tomatoes ..	10	10,590 lbs.	76 8 0
Brinjals (rabi) ..	10	19,320 „ Brinjals 990 „ Coriander	879 14 0
Chillies (local) ..	90		

Sale and repair of implements and distribution of seeds to the public.—A large number of improved implements including plows, stone-rollers for threshing jowar, tooth cultivators, etc., were sold to the public, the plows and spares being the chief items. The total sale amounted to Rs. 6,920-15-10.

In addition to this, large quantities of seeds like early groundnuts, fodder jowars, onion, lucerne, cotton, suran and turmeric sets, etc., were supplied to the public amounting to over Rs. 3,558.

Trials of implements.—Messrs. Satara Industrial Works Company, sent us four of their plows for thorough trial and report. These were tried along with other makes of plows and a report on their plows was sent to the Director of Agriculture, Bombay Presidency, Poona.

THE AGRICULTURAL COLLEGE DAIRY, KIRKEE.

Purpose.—The Dairy is run on business line as stated in last year's report.

Staff.—Mr. M. M. Desai, B.Ag., acted throughout the year under report as manager of the Dairy and Assistant Professor of Dairying and Animal Husbundry at the Agricultural College in place of permanent incumbent Mr. H. G. Baluch, B.Ag., having been deputed to Bangalore for higher training in Animal Husbundry.

Herd.—The following is the statement showing the strength of the herd on 31st March 1925 :—

Animals—	
Cows	36
Cow-heifers	42
Cowbull-calves	20
Cowbulls-breeding	4
Buffaloes	44
Buff-heifers	55
Buff-bulls-calves	5
Buff-bulls-breeding	3
Bullocks	33
Horses	2
Total ..	244

Breeds.—The herd consisted of Sindhi cows, Surati Buffaloes and a few cross buffaloes. Breeding for higher milk production was continued.

Statement showing the milk yield results of the herd.

Year.	Average No. of Adult animals.	Average yield of the herd.	Analysis of column 2.		Average yield of cows.	Average yield of buffaloes.
			Cows.	Buffaloes.		
1923-24 ..	105·3	2,384·0	41·0	64·3	2,427·20	2,345·6
1924-25 ..	91·2	2,671·5	37·9	53·3	2,970·0	2,493·0

Milk production.

Year.	Average No. of adult animals.	Average No. of animals milked.	Total milk production in lbs.	Average milk yield per head per year.	Cost of productions of 100 lbs. of milk in Rs	Total milk fed to calves lbs.	Total milk sold.	Value realised per 100 lbs.
								Rs.
1923-24 ..	105·3	71·0	251,078	2,384-0	*(18·7) 17·3	18,293	232,775	16·8
1924-25 ..	91·2	63·3	243,643	2,671-5	*(18·9) 17·3	20,667	222,976	18·0

* Figures in brackets show the cost of 100 lbs. of milk available for sale after feeding Calves,

It will be seen from the above statements that both the cows and the buffaloes fared better during the year comparatively in point of their respective milk yield. The cow herd taken as a whole shows an improvement by about 22 per cent. over the last year. The average milk yield of the whole herd cows and buffaloes combined shows an improvement by about 16 per cent. over the last year.

We could produce milk during the year at the same cost as that of the previous year and could realise a bit more on the produce.

General remarks.—In spite of a high pressure of work of teaching, administration, service and propaganda it must be said to the credit of the staff of the Agricultural Section that they did their work very satisfactorily and without any complaint.

B. S. PATEL,

Professor of Agriculture.

APPENDIX J.

Report of the work of the Agricultural Chemist to Government of Bombay from 1st July 1924 to 30th June 1925.

1. The work under the Agricultural Chemist may conveniently be divided into five sections for report. They are :—

(1) Analytical work done for the public and for other sections of the Agricultural Department and for other Government Departments.

(2) Investigation work.

(3) Teaching at the Poona Agricultural College.

(4) General supervision of the Manure-mixing Laboratory attached to the Union Agency, and

(5) Water-finder work.

2. *Analytical work.*—The number of samples received during the period under report was 1,240. This number does not include those samples which were analysed in connection with the investigation work carried on in the Chemical Laboratory. The 1,240 samples consisted of 290 soils, 272 manures, 491 waters, 53 feeding stuffs, 20 fruit samples, 17 oils, and oil seeds, 19 milk and milk products and the remaining 78 consisted of miscellaneous samples of various sorts.

3. The samples received from Government Departments numbered 752. The Government samples were analysed in connection with the various investigation problems which the Agricultural Department is carrying on.

4. Some time ago the District Agricultural Overseer of North Kanara observed that some patches of land along the sea coast were showing deterioration. Several samples in this connection were examined for their lime contents and hydrogen concentration values. They all showed deficiency of lime and acid reaction as compared with soils of normal character. Addition of lime to these soils was tried last year on a few patches of land and gave encouraging results. It was on this account that a number of samples were examined. Experiments with addition of lime are being tried on a number of plots to confirm the results obtained.

5. Some time ago a trouble arose in connection with the water charges on the Hathamatti Canal. The cultivators maintained that their soils contained more water than the soils on the Kharicut Canal and therefore they said that the water charges for them should not be raised to the level of those on the Kharicut Canal. To investigate the truth of what the cultivators say three villages on each canal were selected and soils from two fields in each village were taken at two different periods, once in January and then in April 1925, and the water contents of the samples were determined. A report on these determinations has already been submitted.

6. The real test of the success of the laboratory is not shown by the use which the Government Departments make of the laboratory. It is shown by the use which the public and especially the cultivators make in getting their samples analysed and their difficulties solved. A large number of samples were received during the year under report from actual cultivators and from men engaged in Industries depending on agriculture. The total number of samples was 488.

7. Out of 488 samples, 154 were soils, 212 manures, 38 waters, 8 feeding stuffs, 10 oil and oil-seeds, 17 milk and milk products, and 49 miscellaneous. Some time ago it was pointed out that the manures put on the market are sometimes adulterated and the cultivators lose much by not getting their manures analysed. The number of manure samples sent for analyses by private persons is increasing. In the year 1921-22 the number was only 37. In the year 1922-23 it was 92, which rose to 137 in 1923-24, while in the year under report the number went up to 212. One or two oil mills sent their oil seeds and oil cakes to determine the percentage of oil to enable them to check the yield of their oil. Amongst other samples were vegetable ghees, butter, insect powder, liquid insecticides, etc.

8. *Investigation work.*—Investigation of small problems referred to the Agricultural Chemist are generally included under analytical work and in this report they have been so included under that heading. Mention of other problems may, however, be made under the heading of Investigation work.

9. The study of the changes in the nitrogen contents of the soil in connection with the experiments of ridge cultivation of cotton at Surat was completed. The results will be included in the publication of work on ridge cultivation.

10. The investigation in connection with the recuperation of nitrogen in the Deccan soils was in part completed. The results obtained are interesting and valuable. These have been put together and sent for publication. Further work is taken on hand and will be continued.

11. The work in connection with the manuring of rice crop is being continued in co-operation with the Rice Experimental Station at Karjat. The study of the difference in effects of the phosphatic manures on the Kumta and Karjat soils is included in this investigation.

12. Mr. N. V. Kanitkar, M.Ag., B.Sc., Assistant Porfessor of Chemistry, continued his village survey work to study the economic condition of the Deccan villages.

13. *Teaching.*—I was responsible for the teaching of Geology and Chemistry to all the classes at the Agricultural College. On account of the increased number of students the teaching work has become very heavy in recent years, and the teaching staff in the chemistry section finds it extremely difficult to do much by way of continued research work. They utilise their spare time in working on small problems which are now offered by the public for solution.

14. *Manure Mixing Factory.*—According to Government Order No. 7790, dated July 27th 1918, Revenue Department, a chemical laboratory was attached to the Union Agency with a view to encourage the use of manures by preparing mixtures of manures for the various crops. Last year Mr. B. H. Patil was in charge of that laboratory. He analysed in all 310 samples consisting of 2 soils, 37 manures, 73 manure mixtures and 198 samples in connection with the investigation work he had on hand. The problems were (1) Fineness and uniformity of mixtures of manures prepared in the factory, (2) deterioration of manure mixtures and (3) the solubility and the action of Radiophos under field conditions.

15. *Water Finder Work.*—During the year under report Rs. 497 were received as charges for the loan of the machine. The machine was lent to 44 villages and 284 spots were tested out of which only 37 gave indications of under-ground water currents. The machine was specially sent to Bagewadi taluka of Bijapur District for over a month as the taluka is very short of water.

16. I am glad to say that all the assistants under me worked very satisfactorily during the year under report.

D. L. SAHASRABUDDHE,

Acting Agricultural Chemist to the
Government of Bombay,
Poona.

APPENDIX K.

WORK DONE UNDER THE ECONOMIC BOTANIST TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1924-1925.

Dr. William Burns held charge of the work till the end of April 1925. Mr. G. B. Patwardhan, B.Sc., Assistant Professor of Botany, acted as Economic Botanist during the remaining period of the year. Mr. L. B. Kulkarni, M.Ag., Assistant Economic Botanist, is acting as Assistant Professor of Botany since May 1st, 1925. Mr. R. B. Deshpande, B.Ag., acts in Mr. Kulkarni's place. Mr. Narayanayya, Herbarium Keeper, was on leave for a month and half from 1st March 1925 to 15th April 1925. Mr. V. N. Sane, B.Ag., continues to act as Demonstrator and Mr. W. V. Joshi, B.Ag., as Assistant Economic Botanist. The Economic Botanist held charge of the current duties of the Plant Pathologist to Government, Bombay, Poona, also.

Education.

Teaching of Botany to the College classes is continued as usual.

Fifteen students specialised in Advanced Botany and Horticulture in the final year of which 12 were for the degree course. 11 passed including the three of the Diploma Course. One candidate scored *First Class.*

Mr. S. V. Godbole worked up a thesis for the M.Sc. degree in Bajri under the direction of the Economic Botanist. He was admitted to the degree.

Training was given to Mr. Contractor in special Horticulture regarding the planting, maintenance of a Botanical Garden.

Students of Agricultural Schools, of Training Schools for Men and Women of Poona and outside annually attend the College when demonstrations were held for their benefit.

Exhibits were sent to the Mahomedan Educational Conference held in Poona in October 1924.

Seed Testing.

The number of seed samples tested was 200.

Effect of Sunlight on Germination of Papaya.—Comparative tests under variation in exposure to light showed that seeds exposed to sunlight from morning to 11 a.m. only gave maximum percentage of germination, *viz.*, 72·5 per cent., while under laboratory conditions the percentage varied from 0·5 per cent. to 3·5 per cent.

Germination of Michelia Champaka.—(Son Champa seeds). There is a great difficulty in raising plants from seeds. Several trials, made for speeding up germination failed to solve the difficulty.

Longevity experiment.—This is the fourth year of the experiment. Out of 17 crop seeds, it is only groundnut that has been showing a fall in

germination. At the start the germination of it was 96 per cent. but now at the end of three years it has fallen to 22 per cent.

Plant Economics and Advice.

Sixty-four enquiries connected with Economic Botany and plant products were received and answered. In the Herbarium 294 specimens sent by the public and department were identified. Fifty new sheets were added. 1,300 spare sheets were supplied to the Royal Institute of Science, Bombay, to form a nucleus of their Herberium. Advice on pasture improvement and turf planting was sought and supplied to the Western India, Golf Club, P. Y. C. Hindoo Gymkhana, Poona, to an inquirer at Ambejavlgi (Barsi) and Hansot (Broach).

Research.

Canal weeds.—The experiments were closed this year. The results are being compiled into a couple of papers for publication.

Safflower.—Safflower breeding was continued with the object of confirming the fair amount of consistency shown by Nos. 7 and 6 strains, the former in the oil percentage and the latter in the yield. The original stock of 22 strains from Pusa is maintained. No. 7 variety which has been showing hopeful results for the last two years, was given a trial on a larger area than before. The area was roughly divided into two parts and one of which was given two irrigations and other was left without irrigation. The same method of cultivation as that of last year was being adopted in the so-called irrigated area, with excellent results again. The unirrigated area was sown as is done by the cultivators, but with no mixture of Jowar or some such crop. In order to have an idea of the performances of this No. 7 and compare it with the performances from seed grown out of cultivators' stock, the plan of cultivation fixed up in the unirrigated area was 16 rows of No. 7 alternating with 4 rows of the cultivators', the cultivators' rows functioning as check rows. In the unirrigated area, 4 beds were given to No. 7 alternating with cultivators and each of these beds having two rows.

The comparative yields of 100 plants of No. 7 were :—63⅓ ozs. and 32 ozs. in irrigated and dry areas respectively. While the corresponding cultivators' stock gave 41½ ozs. and 30 ozs. respectively. It can be seen that No. 7 has proved to be decidedly better strain than the cultivator's in yield. The crosses referred to in previous report have not proved hopeful.

Fuller's Teasle.—Contrary to last year's expectation this has given heads in one year only.

Bajri Research.

This investigation was started in the year 1921 with a view to breed types of Bajri more drought resistant than the average crop grown in the Deccan. During the first year (1921) a selection of such plants as

were actually found to thrive better than their neighbours was made from fields that were affected by drought and this was grown year after year from 1922 onwards. The following are the important results :—

(1) Further selection on the basis of drought resistance has not become possible even though the plants were grown on extremely poor soils. Last year, *i.e.*, in 1924, though the selection were also grown without irrigation at Manjri (a place with smaller rainfall than Poona) the conditions were not severe enough to any of the strains to wilt. Hence, the committee controlling the research have decided to continue selection work mainly for yield, earliness and other qualities keeping drought resistance as the secondary object in view.

(2) Attempt at isolation of pure types as distinguishable by leaf-hairiness was continued during the last year. There is some amount of splitting yet occurring in the different strains inspite of the precautions taken to prevent cross-pollination by bagging.

(3) The non-hairy types have again shown themselves to be superior to the hairy ones in yield. This was found to be consistent during the last three years. Amongst the two hairy types, the superiority or otherwise of each of them has not become established as yet.

(4) The various selections that are being continued at present were found during the last year, to be somewhat superior to the Akola variety from point of yield.

Drum Experiments.—To investigate conditions of wilting continue.

Lantana Eradication.

A further experiment on 38 plants has shown that by painting poison on close cut (close to the ground level) stem facilitates the travelling of the poison to the tip of the roots 3 feet long while the same done at 6″ above ground does not help the penetration of the poison beyond 2 inches.

Grass Investigations.

Kalas Plot—General observations.—The growth of the good perennial grasses on the hill portion is very hopeful. The main point is to speed up this colonisation. In the low lying part, the development of excellent grasses, *viz.*, A. annulatus and Iseilema laxum was greatly hampered by water logging which gave rise to a swamp like flora. The area though fit for grazing, is not in a condition to be overgrazed and trampled heavily. A close community of perennial tussock grasses holds surface water and prevents wash and erosion. Much dead matter however prevented the penetration of water into the soil. With proper management there would be no such dead material as grazing would remove all stalks up till the last moment.

Burning.—An accidental fire of February 1924 upset the programme to some extent. In the low lying portion, Iseilema laxum, Andropogon annulatus and A. caricosus began to sprout from the burnt stumps ten

days after the fire and made rapid progress thereafter. Some of the stumps of A. annulatus actually flowered within six weeks of the fire. The hot weather of April killed the new shoots and foliage. On the hilly portion the only grass to sprout was A. triticeus which gave new foliage. This also died in the heat of April. Of the non-graminaceous plants Evolvulus alsinoides, Euphorbia coccinea, Tridax procumbens and Vicoa auriculata rapidly put forth new foliage.

Later Effects.—There was early growth at the break of the rain and a greater development of foliage than in the unburnt portion. Germination of seeds of all kinds in the spaces on the burnt area was more dense than in other places.

Grazed Area.—Two bullocks were left loose to graze the stuff on the area, in the middle of September continuously for 4 days in the morning. It was observed that only on the high level little stuff from A. contortus (annual) having no awns, was eaten ; while on the lower level area, only tender growth of A. annulatus, was attacked. In short much of the vegetation remained untouched by the animals probably on account of the hard stumps of the previous year as well as the coarseness of the vegetation. These observations premature as they are, indicate that it is not only economic to protect the area from grazing the whole year but it is also harmful to the further revegatation of the area since the accumulated dry stuff prevents moisture penetration and fresh growth.

Quadrut Observations.—In every quadrut except in group No. 3 there is an increase of population of plants from 1920. Also in the Scraped and burnt quadruts from 1921. The 1924 results show a markedly denser population.

Kandivili Plot—Silo.—The green stuff of 37,500 lbs. from one and half acre of the enclosed area, was put in a silo of 17'diameter 11' depth dimensions in the middle of September. The stuff consisted mainly of Polytoca barbata and Ischaemum aristatum. The cutting and filling of the green stuff required 11 days and the cost was Rs. 75 from start to finish. The silo is not yet opened ; the results will be reported in due time.

General Observations.—In the fenced area grass began to sprout earlier and produced a heavy yield at 30,000 lbs. green per acre during the season. The area cut in September produced a second growth up to six inches high and was sufficient for grazing. While the unenclosed area produced yield at the rate of 10,000 lbs. per acre and the stuff was also less in height. Anthistiria ciliata was dominant on the western side parallel to the railway line when the soil had been disturbed. This observation confirms the Tegur results. And the Gowraksaka people also have begun to appreciate the work done under the guidance of the G. C. and feel more and more the necessity of improvement of the pastures. With the help and co-operation of the Gowraksaka people and the Live Stock Expert to Government B. P. Poona much more improvement will necessarily be done as years pass on.

General Observations.

Chharodi.—Whenever there is a slight excess of water in the soil or where water tends to accumulate for a short time in the rains, there is a pure stand of Ishaemum rugosum and very marshy land produces Eragrostis cynosuroides. Under trampling and overgrazing the fine grasses, *viz.*, A. annulatus Aplida Varia, Polytoca barabata and Iseilema wightii tend to disappear and their places being taken by ruderals and inferior grasses such as Indigofera linifolia, I. cordifolia, A. contortus Chloris pallida and Aristida funiculata.

General Observation.

Bankapur.—All grasses had been badly damaged by grass hoppers. Ischaemum laxum suffered especially, practically no flowering heads left on the plants.

Potato Investigation.

Growing and Storage Experiments.—These were conducted in the Rabi and hot seasons of 1924-1925 at three places, Agricultural College Farm, Mahableshwar and Benkanhalli (Belgaum) with three varieties of seeds. The method of cultivation followed was precisely what is customary in the localities concerned.

It has been found that the fresh Italian White Round variety has yielded more than the Great Scot which was of course freshly imported.

It was observed on the College Farm plots and the Mahableshwar Plots that the Italian White Round ripened about 10 days in advance of the Great Scot where as the Gulabi variety in its turn ripens at about the same time as the Great Scot. Thus the Gulabi and the Great Scot may be said to be late varieties than the Italian White Round.

Storage Experiments.—In order to ascertain which of the three places were best suited for storage, the potatoes as soon as harvested they were stored at the same places more or less after the usual manner in Belgaum and Mahableshwar and in the Union Agency's store with usual methods of lowering the store temperature, in the College Farm. Thus the Belgaum and Mahableshwar potatoes were stored in ordinary rooms by heap method without any special measures to lower the temperature. The potatoes in any of the stores were not fumigated because it was not possible in Belgaum and Mahableshwar and partly because it was not necessary for Poona potatoes as they seemed remarkably free from any infection of *moth* and as the fumigation if necessary could be done at any time. The College Farm potatoes were specially not fumigated as this would have been an extra factor with the College Farm stock the storage of which was to be compared with the Mahableshwar and Belgaum storages with which fumigation was not possible. Fortunately in any of the three stores, *moth* at any of the stages did not appear at all. Last year the attack of *moth* to Mahableshwar potatoes proved very serious at about the end of the hot season. It may be said in passing that the

moth trouble was far from being serious to any extent this year even with cultivators at Mahableshwar, Belgaum and also almost throughout the Khed Taluka. This appearance and disappearance of *moth* in certain years is a peculiar phenomenon.

The results of these experiments indicate that on the whole Mahableshwar is a place better suited for the crop and the results of storage experiments show the same things but it appears that the place does not show any *striking advantages* over Poona improved method.

The Great Scot variety has shown better results in storage everywhere although it has not shown any specially high yielding capacity.

Scab Disease.—The results of trials clearly indicate that the *Great Scot variety* is the most resistant and the pink variety is the least so, whereas the Italian White Round variety stands midway between the two and is almost as good as the Great Scot in this respect. Then again, whatever number of tubers were seen affected with Spongospara from the Italian White Round variety (which is often a mixture of many purely white and a few more or less pink skinned tubers) were mostly from the pink coloured turbers, thus indicating that the pure Italian White Round strain is much more resistant to the disease than what is represented by Italian White Round mixture in the statement. Anyway, it can definitely be stated that both these varieties (Great Scot and Italian White Round) are very much more resistant though not immune of the Scab Disease. Now that the above phenomenon of greater resistance to Scab Disease is observed for two years with the Great Scot, a statement may definitely be made that the Italian White Round variety is much more resistant to Scab Disease than the pink Italian variety grown at Mahableshwar.

Mite Disease.—Dusting experiments were conducted at the Agricultural College Farm with a dozen small potato plots distributed all over the Farm each situated at least 500 yards away from each other. Nearness of the other crops likely to be affected with the mite disease was avoided. It was generally found that the percentage of sulphur content in the dusting mixture could be effectively reduced up to 10 per cent., and the quantity of such mixture required per acre of the normal potato crop was found to be 20 lbs. of the mixture of the above strength. Some poorer strengths also showed effects on the crops but duplicates of the above failed to show good effects. Thus 20 lbs. of the mixture with 2 lbs. of sulphur and the remainder of lime can be recommended finally for treatment of the crop against mites. The dusting in the experiment was made with the Vermorel "Torpille" Knapsack sulphuring machine.

Some observations regarding the life history of Tambera mite were made with special precautions to keep the affected plant in full control. The pot experiments indicated the following results which will have to repeated before any final conclusions can be drawn :—

(1) That the mite passes its off days on other crops and very largely on weeds not necessarily perennial.

(2) That the dry leaves and shoots having eggs laid on them in previous season are capable of producing the disease on Potato plants near which such dry leaves or moulds may have been kept.

Castor Crop.

This crop has gained importance since the Great War due to special qualities of the oil derived from its seeds. The oil possesses a property of non-freezing in most of the atmospheric temperature through which the æroplane services are being run. The net oilput of seed and oil per acre can be profitably increased; with this aim a large number of different types of castor seeds is collected from almost all places in India for breeding desirable types.

Plant Introductions.

Seeds of selected species of plants were received from the Royal Botania Gardens, Edinburgh and were shown here with the following results :—

1. Begonia Socotriana.
2. Begonia ulmifolia.
3. Grevellia glabrata.
4. Hakea gibbosa.
5. Psiduim montanum.

Seeds of these failed to germinate.

6. Cyperus nutans grew up but failed to thrive further.

7. Torenia flava grew well into plants but did not set seed freely and is not considered suitable here for ornamental purposes as it presented a creeping habit.

8. Commelina pallida grow well. Its narrow leaves, small flowers and erect habit with lankiness are unfavourable character for its general adaptation to culture.

9. Acacia nerifolia.
10. Dodonea triquetra.
11. Cyperus luzulii.

These have thrived well and are likely to be of use for some purposes or another when they grow up still further and become well established. Their growth is being watched with interest.

Seeds from Hawaii.—Biloi soy beans. These seeds grew well. The variety is early ripening but the branches are very fragile.

Cajanus indicus.—(New Era) The seeds grew into very vigorous, tall plants much better than our local ones but had the drawback of absence of simultaneous flowering and higher yield than the local. Two more varieties one from Palur and another from Chin hills showed the same defects.

Cactaceæ-Plants.—Pieces of the plants of

(1) Hylocereus monacantha *Lem*,
(2) Cereus tetragona *Miller*,
(3) Cereus Hexagonius *Miller*

were received for identification from the Victoria Gardens, Bombay in July 1924. They have now sprouted forth into new shoots.

New Grasses.—Two grasses were introduced in the grass nursery and tried for their adaptability to the local conditions here. One was :—

Kikiyu Grass (Pennesetum longistylum) Sets imported from Peshawar and South Africa planted in beds at the end of June established themselves in a week. They were occasionally watered. It grows vigorously and spreads like Hariyali (Cynodon dactylon) grass and seems to be a good grass.

Melinis Minutiflora.—Seeds received from France germinated in 6 days in June. After growing 2 feet high, the plants flowered in November 1924. The plants are hairy and sticky to touch. Cattle were found to eat the grass inspite of the objectional odor, which the plants possessed.

Miscellaneous.

Opuntia Ficus-indica.—Seeds of these were sown in plots in 1923 by professor Patwardhan to see if propagation can be done by these. The seeds germinated well. The plants have now two long joints which show well up and bear no thorns. Propagation by seeds is a slow process.

Algaroba.—Last year's plants have now flowered and we are now having pods of these collected.

More plants were raised from seeds received a fresh from Hawaii. They were planted along the boundry lines of the tennis court and elsewhere and are thriving well.

Investigation of the Adulterant Cumin.—The investigation was undertaken at the instance of the American Consul at Bombay. The adulterant was found to the extent of 12 per cent. It was found that the adulterant was a weed seed which got up mixed during harvest of Cumin. The remedy suggested for the exporters to pay higher prices to the purer samples which will result in the elimination of the mixture.

Groundnut.—A study of the mixed varieties sown on the Manjri Farm was made and the result reported to the Deputy Director of Agriculture,

S.C.D., Poona. Incidently the morphology of the groundnut flower was studied. This study revealed that the groundnut cultivated on this side bears showy yellow flowers which ultimately form the nut. This is contrary to Bailey who says "showy flowers are yellow and sterile, soon withering, fertile flowers on stout recurving stipes without envelops" in his Manual of Cultivated plants. There are several sterile flowers in the same inflorescence.

Publications.

Author.	*Subject.*	*Publications.*
1. Professor G. B. *Patwardhan.*	Vitality in the seeds of "Adenanthera pavonina".	Poona Agriculture College Magazine Vol. XVI, 3 December 1924.
2. *Do.* ..	Review of Practical Botany by Rangachariar.	Agriculture Jour. of India, Vol. XIX, Part IV, July 1925.
3. Dr. W. Burns and Mr. S. R. Godbole.	Further studies on Oecology of grass lands in Bombay Presidency.	Paper read at Science Congress, Beneres, Jan. 1925.
4. Mr. W. V. Joshi ..	Introduction of Italian white Round potatoes at Mahableshwar as a mean of eradicating scab disease of potato.	Do
5. Do. ..	Behaviour of potato *moth* at low temperatures.	Do.
6. Do. ..	Influence of the condition of the potato crop as regards ripeness on the keeping quality of potatoes.	Do.
7. Do. ..	Further investigation of potato cultivation on Western India.	Bulletin No. 121 of 1924 of the Dept. of Agriculture, Bombay.
8. Mr. S. V. Godbole ..	Soils as a factor influencing tillering in Bajri.	Paper read at Science Congress, Beneres, Jan. 1925.
9. Dr. W. Burns and Mr. S. B. Ranade.	Eradication of cyperus rotundus.	Memoirs of the Dep. of Agriculture in India Vol. XIII No. 5 Jan. 1925.

G. B. PATWARDHAN,
Acting Economic Botanist
to Government of Bombay, Poona.

APPENDIX—L.

ANNUAL REPORT OF THE WORK DONE BY THE CROP BOTANIST TO GOVERNMENT OF BOMBAY, POONA, DURING THE YEAR 1924-25.

I held charge throughout the year. Work was done on Rice and Wheat.

Rice.

Staff.—Mr. R. M. Hegdekatti, B.Ag., was transferred to Kumta and Mr. V. L. Bhosekar, B.Ag., from the Hatkhamba Farm took his place as Graduate Assistant. Mr. G. G. Patil worked as non-graduate fieldman.

Season.—The rain started rather late. The total fall was 99·64 inches *i.e.*, less than last year. But it was pretty well distributed. The season was good for the late crop, but the early crop suffered.

Work of the year :—

(1) *Intensive study of cultures.*—In all 22 strains were studied. Almost all were pure for the important characters. Nos. 32, 35, 42, 79, 104, 226 may be said to be faultless. Nos. 104, 42, 226, 227, 35 and 32 have all along been very consistent in their yielding capacity. No. 42 is however the best all round strain. No. 223 had given good promise last year ; it is also fine grained, but it did not come up very high this year. Nos. 226 and 227 seem to be taking its place. These are followed closely by Nos. 237, 225, 222, 121 and 39. No. 121 is very coarse grained. The effect of the season on the various characters has been noted. A record of the order in which the strains arrange themselves in period of growth, fineness and yield from year to year has been kept. This also includes the cultivator's samples. It shows that the very late strain No. 104 has given the highest and the very early ones, Nos. 79 and 184 the lowest yields. The high yielding late strains are only medium to fine grained while the very fine grained samples like No. 39 are among the medium to low yielders. Nos. 164, 240, 241 and 153 are intermediate in ripening and have medium to low yields. The first three are almost alike and coarse grained. No. 153 is rather fine grained.

(2) *Extensive cultures.*—Nos. 153, 164, 32, 35, 39, 42, 223 and 104 were grown on one guntha plot each to increase the stock of their seed as well as to test their comparative yielding capacity on a pretty large scale. Their respective ranks in yield were as follows 7, 8, 3, 5, 6, 1, 4, 2.

Replications.—In addition to the indications obtainable from the intensive and extensive cultures about the yielding capacity of the different strains an attempt was also made this year to get more reliable yield comparisons by growing replications or alternate cultures of our best strains with four different late samples of the cultivator. Thus 5 cultures of No. 42 (1, 2, 3, 4, 5) were grown alternately with six equal sized cultures (long narrow strips) A, B, C, D, E, F, of each of the cultivator's

samples as shown here :— A, 1, B, 2, C, 3, D, 4, E, 5, F, so that differences in soil fertility which are unavoidable should affect the comparisons as little as possible. The end effect on cultures A and F was also avoided by growing extra lines outside A and F which were not included in the comparison. Each culture contained about 150 plants. The spacing given was the same throughout. The test was made by adding A to B, dividing the sum by 2 and comparing the result with culture 1 and so on. Thus $\frac{B+C}{2}$ was compared with 2, $\frac{C+D}{2}$ with 3, $\frac{D+E}{2}$ with 4, etc. As the number of plants in each culture was not necessarily the same, *i.e.*, 150 owing to damage in some cases by crabs the yield in every case was calculated for 100 plants on the basis of the yield actually got from a given number ofplants. From the successive five differences either + or — thus obtained between the two comparable cultures the mean difference in yield and the probable error, etc., were then worked out, the final conclusion being based on the ratio of difference to error. Similar replications were also grown of our early and intermediate strains for comparing them with corresponding samples of the cultivator. Replications were also grown of our selected strains with 42 as the check.

From the results of all the 18 replications collectively it was found that 42 yielded higher in 14 cases out of 18, the ratio of difference to error being 4·29 : 1. This shows conclusively that 42 is superior to the imaginary composite sample of the remaining 17 cultures. Coming to details 42 was conclusively superior in 8 cases, its superiority was indicated in 5 cases. In one case only it was inferior and in three cases inconclusively so. The apparent inferiority of 42 in these few cases was due to an untoward circumstance.

That 42 is really superior can be seen also from the fact that the per plant yields of the cultivator's samples as well as those of others are poorer in almost all cases as compared with 42 not only this year but for several years. But these figures cannot be given here for the sake of brevity.

With regard to our early and intermediate strains it may be said that cultivator's Mahadi which is a coarse and late sample proved better than our Nos. 79, 184 and 153. Cultivator's Halwar a coarse sample and our strain No. 153 a fine one proved equal in yield, and No. 153 proved superior to cultivator's Ghosali. But on the whole it is essential to evolve early maturing and better yielding types than our No. 153 either through further selection or hybridization. In this latter direction some steps have already been taken during the year.

(4) *Trial on cultivators' fields.*—The high yielding character of No. 42 is also confirmed again this year as will be seen from the experience of some cultivators from whom it was possible to get comparative figures of yields obtained from the local seed and No. 42 grown side by side. In several other cases although the two were not grown side by side still the cultivators were favourably impressed by the yielding capacity of No. 42.

At Kamshet one Mr. Navalkar grew 42 and the local Chimansal in plots close by. After comparing the yields of grain on a common basis he reports an increase from 42 over the local to the extent of about 17 per cent., though he says that he got comparatively less straw from it than the local. One Mr. Ketkar from Shirawli near Khalapur had also grown No. 42 and the local side by side, the former in a plot of 23 gunthas and the latter in 17 gunthas yielding respectively 21½ and 12½ maunds. Compared on a common basis an increase to the extent of 27 per cent. in favour of 42 was thus obtained by him. He however thinks that the plot of 42 was slightly better in fertility than the plot of the local. Therefore making an allowance of about 5 to 10 per cent. 42 might yet be 17 to 20 per cent. better than the local. At Bhisegaon near Karjat one Mahadu Zuru Patil grew 42 on a plot of 32 gunthas and realised 1,750 lbs. of grain. In a plot near by one Nathu Disale of Bhisegaon grew his local seed in a plot of 1½ acres and realised 2,800 lbs. of grain. Worked to a common basis this means an increase of 17 per cent. in favour of 42. At Akurla near Dahiwli, Karjat, one cultivator grew 42 on a plot of 2 acres and 24 gunthas and realised from it 4,760 lbs. of grain. In a field close by he had grown the local seed in a plot of 2 acres and 10 gunthas and realised from it 3,150 lbs. of grain. Worked to a common basis this means an increase of 30 per cent. in favour of 42. At Dapiwli near Jambul several cultivators who grew 42 last year and also this year were favourably impressed with the performance of 42 as compared with the local but they could not supply any figures. In a personal talk with these cultivators they gave their experience that No. 42 does give them an increase over the local which may range from 15 to 20 per cent. With regard to No. 79 the cultivators at Dapiwli could not get any benefit from No. 79 this year, owing to the unfavourable condition of the rains for the early crop. Still they admitted that last year 79 proved to be very useful. They say that it gives the cultivators great relief by supplying them with food at a very early period and saves them from the sawkar to a certain extent.

Our early strain No. 79 was also tried on the Ratnagiri Farm where it is reported to have given about 10 to 15 per cent. more yield than the local. This means that this strain is likely to be very useful in South Konkan at least in the Ratnagiri District where the people require early maturing varieties. This strain was also supplied to the Director of Agriculture, Baroda State, for trial in certain places, and he reports that it is liked by the cultivators there. Unfortunately no definite figures were received from him yet. Our improved strains have also been supplied for trial in the Gwalior State, and the Agricultural Expert, Court of Wards, in that State reports that they yield about 10 to 15 per cent. better than the local kinds.

Area under the improved strains during the year. The cultivation of strains Nos. 42, 35 and 79 in the North Konkan now extends over 12,000 acres. Of this spread about 8,000 acres was due to Departmental efforts and the remaining 4,000 acres automatic. Strain No. 42 is however the most popular so far, and there are grounds to expect that next year it will alone occupy more than 20,000 acres.

(5) *Trial of new selections.*—Of the new panicles Nos. 199, 202, 221, 222, 223, 225, 226, 227, 237, 240 and 241 have already been included in the intensive study series. About most of these mention has already been made there. None of the selections from the bulk samples gave satisfactory yields as compared with last year's performance. It is true that the performance of the last year was that of a selected plant while that of this year is the average performance of the whole progeny of that plant. Still it seems to be much below last year's performance. But a few of the better ones of these will be tried again next year in comparison with 42 as the standard.

Some cultures of this year's new panicles and bulk series which look promising will also be grown next year for a further comparison with 42 as the standard.

(6) *Hybridization.*—Sixteen hybrid seeds were obtained from the crosses made the year before last. Fresh crosses were also made this year between No. 39 and K.O. 37; 39 and 164; 39 and 121 and between several other parents. The behaviour of the F_2 generation of some of these crosses will be studied next year.

(7) *Publication.*—An article on "Variation in rice, Oryza sativa, Linn", was published in the Poona Agricultural College, Magazine, in December 1924. A paper on "Our experience in crossing different varieties of rice at Karjat", was read in the Botany Section of the Indian Science Congress held at Benares in January 1925, and the same was then published in the Poona Agricultural College, Magazine, in February 1925.

(8) In conclusion I have to place on record my appreciation of the way in which the work was carried on by Messrs. V. L. Bhosekar and G. G. Patil.

Wheat.

Staff.—Mr. B. Nazareth, B.Ag., worked as graduate assistant and Mr. G. H. Joglekar as non-graduate fieldman.

Locality, Season, Cultivation, etc.—Work on wheat was again done this year in the Ganeshkhind Botanical Gardens, Kirkee and partly at the Agricultural College Farm Poona. The seeds of some strains were tried again this year at the Government Farms at Dharwar, Jalgaon and Dohad, and in the fields of a few cultivators in Nasik. Land in the Ganeshkhind Botanical Gardens at Kirkee received all the necessary attention and tillage from May onwards. The rainfall received to the end of September was only about 17 inches. Dibbling of the seeds was commenced on 13th October. No watering was given at the time of dibbling. But many of the seeds failed to germinate, and resowing had to be done to fill the gaps. To help the germination a light irrigation was given on 30th October. Though given about a fortnight after the first sowing, it helped the germination of both the newly sown and dormant seeds. The sprouting thereafter was quick, the appearance of the plots pretty satisfactory, and very few gaps could be seen. There was

cloudy weather and very light rain, about 34 cents, in November, and a light irrigation was again given at the end of December, when flowering had commenced. In the interval when the soil conditions became suitable, interculturing was also practiced with the help of the hand-hoe to preserve the soil moisture.

Cultures under intensive study.—16 strains including Pusa 4 and the rust resistant Khapli were studied. The purity and the general capacity of these have been fully tested. The different strains were again grown in duplicate series to test their behaviour in more and less irrigated conditions. The twice irrigated series was badly affected with rust but the once irrigated cultures though short and stunted for want of enough moisture practically escaped its attack. A third series of all the strains which was hand-sown after the fashion of drill-sowing was also grown for comparison with Pusa 4 under the replication system. In this series an equal quantity of seed was sown in each culture. Pusa 4 was used as a standard in all the series. In this way it was expected to get very reliable comparison of the various strains with Pusa 4 from the point of yield. But this series being irrigated twice to insure good growth was affected with a severe rust attack, and gave practically no yield worth the name except from Pusa 4 and the resistant Khapli. In a different strip of land which was given optimum conditions of moisture for the appearance of rust, the rust resistant capacity of Khapli and Pusa 4 was compared. Khapli proved to be as resistant as, or even better than Pusa 4.

At the Agricultural College Farm only Nos. 103, 162, 167, 171, 186, 200, 210, 224 and 237 were replicated with Pusa 4. All these replications were grown in quite dry conditions. Some damage was done by stray animals to some of these but there was no appreciable troble from rust so as to reduce the yield. The results show that Nos. 103, 162, 224, 167, 210 and 237 are pretty constant in their high yielding character. The following yields were obtained :—

Results obtained at the Agricultural College Farm.

Strains.	Yield in lbs. per acre calculated.		Rank.		Remarks.
	1922-23.	1924-25.	1922-23.	1924-25.	
Pusa 4	....	810	..	9	Soil poor. Damage by cattle much.
103	1,459	885	1	7	
162	1,319	913	2	4	
167	1,144	902	4	5	
171	1,124	766	5	10	
186	1,098	888	6	6	
200	1,031	830	8	8	
210	1.010	995	9	2	
224	1,244	998	3	1	All these in good soil.
237	1,096	943	7	3	

In the above figures some allowance had to be made in some cases on account of damage done by the stray cattle.

Trial of strains outside Poona.—At Dharwar strains Nos. 103 and 162 which had given good results as regards yield last year were grown again this year. But there was a severe attack of rust at Dharwar this year and no comparable results could be obtained.

At Dohad the following results were obtained with the strains given below :—

Results obtained at Dohad.

Strains.	103	162	167	168	171	224	Remarks.
Yield in lbs. ..	44	51	41	54	49	33	All the cultures including the local were grown in two gunthas each.
Yield in lbs. local Baxi.	48	52	43	49	43	35	
Difference ..	−4	−1	−2	+5	+6	−2	

Here also the cultures were affected with rust, and there was practically no difference between the local Baxi and three of our strains, while two of our strains actually gave more yield than the local.

At Jalgaon 6 of our strains were grown with alternating cultures of the local Bansi as shown below :—

103 : L : 162 : L: 167 : L : 168 : L : 171 : L : 224 : L : (L= Local). Each culture occupied 5 gunthas. The following were the results obtained :—

Results at Jalgaon.

Cultures.	Yield in lbs.					Remarks.
	Per plot yield.		Per acre yield.			
	Grain.	Chaff.	Grain.	Grain.	Chaff.	
	1924.		1923.	1924.		
No. 103 ..	137	177	512	1,096	1,416	Better than local.
L. Bansi ..	128	166	..	1,024	1,328	Do.
No. 162 ..	120	157	768	960	1,256	
L. Bansi ..	108	130	..	864	1,040	
No. 167 ..	104	167	832	832	1,336	
L. Bansi ..	114	160	..	912	1,280	
No. 168 ..	86	137	704	688	1,096	
L. Bansi ..	93	163	..	744	1,304	
No. 171 ..	80	133	672	640	1,064	
L. Bansi ..	108	128	..	864	1,024	
No. 224 ..	115	166	928	920	1,328	Better than local.
L. Bansi ..	102	131	744	816	1,048	

It will be seen from the above that No. 103 yielded more than the one local available, No. 162 yielded more than one of the two locals and more than their average, while No. 224 yielded more than both the locals. Nos. 224 and 162 had also proved to be so last year. No. 103 had somehow suffered last year but it seems to have shown its true performance this year. No. 167 seems to have suffered this year though it had done better than the local last year. Nos. 168 and 171 being more susceptible to rust and Alternaria have suffered in grain though they have given more chaff than the local. It is worth while trying these in very dry conditions where the above mentioned fungoid diseases may not effect them.

At Ganeshwadi about three miles from Nasik, No. 103 was the only strain tried. It was grown along with the local on plots of ten gunthas each. The following results were obtained :—

Results obtained at Nasik.

Culture.	Yield in lbs.				Remarks.
	Yield per plot of 10 gunthas.		Yield per acre.		
	Grain.	Bhusa.	Grain.	Bhusa.	
No. 103 ..	168	278	672	1,112	
Local Piwla ..	152	243	608	972	
Difference ..	+16	+35	+64	+140	In favour of 103.

This is a further corroboration of No. 103 which had not done well at Jalgaon last year but which showed its real performance there this year. The District Agricultural Overseer who was in charge of this trial reports that the lustre of the strain will fetch about two rupees more per bag.

Hybridization.—At Ganeshkhind Botanical Gardens with the object of breeding rust resistance into some of our desirable types, several crosses were made this year between Pusa 4 or Khapli as one of the parents and one of the promising types as the other parent. But owing to the attack of rust no good seeds were obtained except in a few cases. The F1 plants of last year's crosses also produced no seed except in some cases, and in these also the seed was much shrivelled. Attempts will be made however to grow these next year to see if they can produce any good plants at all.

The seed of the rust resistant Khapli strain has now been multiplied to some extent. Some of this has also been supplied in the Jamkhindi State.

In conclusion I must say that in the absence of good wheat land and favourable conditions for the wheat crop, I was not able to obtain as good results as I had anticipated. But I was satisfied with the manner in which Messrs B. Nazareth and G. H. Joglekar carried on the work under the existing conditions.

R. K. BHIDE,
Crop Botanist to Government of Bombay,
Poona.

APPENDIX M.

Annual Report of the Plant Pathologist to Government of Bombay, Poona, for the year 1924-25.

Staff.

(1) The Section of Plant Pathology continued to be in temporary charge of the Economic Botanist to Government, Bombay, Poona.

(2) Mr. G. S. Kulkarni, M. Ag., continued to work under the Indian Cotton Research Committee on the Cotton Wilt problem and Mr. M. N. Kamat, B. Ag., Lecturer in Mycology, was appointed as Assistant Professor of Mycology.

(3) Mr. J. D. Randive, B. Ag., Assistant Mycologist, resigned and his place has been taken up by Mr. J. S. Malelu, B. Ag.

Educational.

(4) The usual University courses in compulsory and Optional Plant Pathology were given to Students at the Poona Agricultural College.

(5) A lecture and demonstration in vernacular on Plant diseases in general and Diseases of Sugarcane in particular were given to the Sugarcane Class at Manjri in Christmas week.

Routine Work.

(6) The total number of specimens received and indentified during the year under report were 92.

Research.

(7) *Gummosis of Citrus trees.*—A number of observations made in different localities have shown that the disease is confined exclusively to the Mosambi (Citrus aurautium) plants usually the collar and in severe cases the scale buds and branches ; gum trickles down in great quantity through wounds, the tree is unhealthy, and gradually succumbs ; the bearing is seriously retarted.

A number of gardens were treated at Baramati, Nanded in Poona District and Junnar Taluka, the total number of trees treated was 319 :— 33 at Baramati, 65 at Nanded and 201 at Junnar. Treatment consisted in first scraping off all wounded parts and then cleaning the wounds by a jet of pure water and then covering it by a solution of 50 per cent. crude Carbolic Acid ; the whole part was then treated with coal-tar. The above treatment has given a fair amount of relief to the affected trees and about 50 to 60 per cent. of the treated trees have revived and withstood the disease.

So far no experiments have been carried out here to investigate the real causes and circumstances that lead to the disease. Several isolations

were made which gave a growth of a *Fusarium* and in a few cases *Bacteria*.

(8) *Fusarium Wilt of Potato.*—The work so far done does not give any indication of the parasitism of the five *Fusaria* isolated from wilted Potato Plants. Further work is being continued.

(9) *Sclerotium Wilt of Potatoes.*—Detailed observations on the outward symptoms have been made; the fungus *Sclerotium Rolfsii sacc.* has been studied in pure cultures and experiments so far have proved the parasitic nature of the fungus on plants as well as tubers. Direct inoculations of plants and planting of inoculated tubers in sterilized soil have both given complete success.

(10) *Fruit Rot of Pomegranate.*—This is a serious fungoid disease in the monsoon and causes a heavy loss to the cultivators. The disease is prevalent round about Poona; a wet rot sets in near the stalk and the fruits and flowers drop down in large numbers.

The fungus is a species of *Phoma*; the parasitism has been proved by inoculation experiments.

(11) Experiments were tried to determine the efficacy of Germisan (a German product) against grain Smut. (*S. Sorghi*) of jowar as compared with copper sulphate. Good seed of jowar was divided into three lots, each being treated in the following way and then sown :—

Lot I Immersed in Germisan (4 ozs : 100 gallons of water for half an hour.)

Lot II Immersed in copper sulphate mixture (1 lb. in 50 gallons of water for 15 minutes.)

Lot III Control.

Germisan was found to be as effective as copper sulphate, but being foreign and not easily and readily obtained and further being a little more costly, it cannot be recommended as a substitute for the copper sulphate.

Mango Blight.

(12) Spraying trials were carried out in co-operation with the Eutomogical and Horticultural sections at Thana. There was a severe attack of hoppers but no mildew (*E. cichoracearum*) appeared in the garden.

New Diseases.

(13) A number of cocoanuts, reported from Kanara, to drop down while still immature to the extent of 20 per cent. were examined and found to give a pure growth of *Diplodia-a*-fungus not so far reported to attack this palm in this Presidency. The disease is being studied in co-operation with the Konkan Agricultural Staff.

Publications.

(14) Koleroga disease of areca palms by M. N. Kamat, B. Ag., published in the Agricultural College Magazine, Vol. XV, No. 4, 1924.

G. B. PATWARDHAN,
Plant Pathologist to Government,
Bombay Presidency,
Poona.

College of Agriculture, Poona,
5th November 1925.

APPENDIX N.

Annual Report of the work done by the Soil Physicist to the Government of Bombay, Manjri Farm, during the year 1924-1925.

The work of my branch is mainly so directed as to find out by research the best possible method of cultivation, to avoid or reduce, as far as possible, the occurrence of famine in areas of precarious and scanty rainfall. My Head Quarters, which were at Poona, have been transferred to Manjri, a place, which has comparatively much lower rainfall than Poona, Nagar or Sholapur and which is besides situated within easy reach of the Agricultural College, Poona, with its well equipped library and laboratories belonging to various branches of Agricultural research which have to be consulted frequently.

Help is also given to the public as well as to the other branches of the Department in matters relating to physical conditions of soils whenever these are referred to me. A number of inquiries from Sind were addressed to me regarding the nature of 'Kalar' or salts formed in the alluvial soils in Sind, which were attended to. To avoid repetition of Laboratory work reference was given to bulletin No. 96 of 1920 of this department which is not yet sufficiently known in Sind although it has a direct bearing on the question and much detailed information regarding analyses of soils, waters and different kinds of 'Kalars or salts' in Sind can be obtained in it.

The actual research work at the new quarters at Manjri commenced in the year under report on Rabi Jowar by methods known as Dry-Farming.

Dry-Farming.

To make the utmost use of rain-water, for the proper growth of plants, is the main object of Dry-Farming. This was aimed at by—

(1) increasing the water-storing capacity of the soil by repeated ploughing and harrowing so that rain-water may well soak into the ground.

(2) by levelling the plots and putting small bunds round each plot to prevent 'run-off' even when rain fell in heavy showers.

It was found that the highest rainfall at one stretch on the Kuran land at Manjri was 2·91″ which fell on 17th October 1924 from 4-30 to 5-15 p.m., *i.e.*, in 45 minutes. In the absence of bunds much of this rainfall would have been lost by surface wash or 'run-off' but small bunds nine inches in height and nine inches broad at the bottom were found sufficient to impound the water in the plots. Such temporary bunds are very useful especially on level lands and do not cost much.

(3) by repeatedly stirring the surface of the soil by a hand-hoe to create a soil much so as to prevent evaporation of water that had entered the soil;

(4) by adding green manure so as to increase the water retaining capacity of the soil without lowering the water supplying power of the soil as indicated by previous laboratory experiments done by the dilatometric method of Bouyoucos.

A number of plots were laid down, each plot being one guntha (1/40 of an acre in area). In most cases three such plots were assigned to every experiment so as to get a better confirmation of results obtained in each of the plots. Seed (Kalbondi Jowar) was dibbled by hand in each of the plots at a distance of 18 inches so that the distance between any two rows as well as the distance between any two plants was 18 inches. This facilitated interculture on all sides of the plants, which helped a good deal in stopping evaporation and thus conserving moisture for the proper development and growth of plants.

In each plot all the plants on the two diagonals were marked and kept under observation throughout their growth. The result of this close study brought to light the fact that the more use of water the plants make, within certain limits, the more is the height and the girth of the plants but longer is the period of growth. The yield also increases with the increased quantity of water used by plants. Thus in one series of plots, in which no attempt was made to impound rain-water by putting bunds, but in which the water that entered the soil was conserved by soil mulch, the total yield per acre (calculated from three gunthas) was about 776 lbs., while in another series of plots, which had small bunds and where rain-water was not allowed to run off the surface the total yield per acre was 826 lbs., whereas in that series of plots where green manure was applied in addition to the precaution of putting bunds the yield per acre rose as high as 1,136 lbs. of grain per acre or about 35 to 40 per cent. over the usual average yield. It appears, therefore, that if the factors, which helped in increasing the yield by the application of green manure, be investigated perhaps fresh light may be thrown on the subject and the prominent factor or factors may be found out which have a direct bearing on the increased yield of the crop. This is being now investigated.

Frost.

A severe spell of cold weather extended over a great part of Poona District and elsewhere in the Presidency at the end of January and did a considerable damage to the standing crop of Rabi Jowar on a number of cultivators' fields; but fortunately not the slightest sign of any damage done could be traced on the Dry Farm experimental plots at the Manjri Kuran land, where the standing crop could give a bold stand and defy the severity of the cold weather.

It is a general belief that a peculiar cold dry blast of wind sweeps over a portion of the country and damages the crop over which it blows giving it a parched or burnt-up appearance. It may, however, be observed that in the affected area a number of plants could be seen which have withstood the severity of the cold blast of wind and have escaped damage, inspite of the fact that the neighbouring plants have

suffered very severely. This shows that there are certain factors which enable the plant to withstand the extreme weather. From the experience at the Manjri Kuran land it appears that keeping a soil mulch on the surface of the field and thus preventing the soil from cracking helps a good deal in maintaining a higher temperature near the root zone whose power of absorbing water from the soil is not materially impaired and which therefore supplies a fair amount of water to the aerial leafy portion of the plant from which water is abstracted by the dry cold wind. Plants whose roots have not been killed may show apparent signs of death but would gradually revive, death being only localised in certain portions of leaves, etc.

As the occurrence of frost in the Bombay Deccan is not so frequent as to warrant a close study of the problem in the open field only a few laboratory experiments will be undertaken to find out the effect of very low temperature on the underground and aerial portions of the plant.

Experiments at Mohol.

The Deputy Director of Agriculture, S. C. D., was kind enough to reserve for me a small area on the Mohol Farm for experiments in Dry-Farming. A few experiments were then tried at that station to see if the results obtained at Manjri are corroborated in the dry tract near Sholapur. The experiments corroborated the fact that small bunds on level land were efficient in stopping rain water from running off the surface with the result that the outturn in a bunded plot was always more than that in a plot without any bunds, interculture being common to both.

These experiments are being repeated during the year 1925-26 with a couple of plots more for green manuring experiments as these have shown to be promising at the Manjri Kuran land.

Nagar Experiments.

A few experiments on the lines of dry farming were started by me on a piece of land belonging to the late Mr. Patwardhan, pleader of Nagar, who was kind enough to place a small portion of his land and labour, etc., at the disposal of Mr. V. V. Gadgil, B.Ag., District Agricultural Overseer, who was good enough to co-operate with me in conducting the experiments. The results of the experiments, carried for two years, showed that next to Farm Yard manure, green manure, if properly attended to, had a fair chance of success. But the experiments could not be carried on further owing to the sudden death of the donor and also for want of an assistant who could always be on the spot to pay closer attention to the details of the experimrnts.

Staff.

My scientific staff which mainly consists of one graduate fieldman and one non-graduate field-man have put in a very good year's work. Mr. G. M. Bapat, M.Ag., has shown a great liking and a good capacity for research work and deserves encouragement.

The staff, however, is found inadequate to cope with the increasing work in the field and in the Laboratory in addition to pot-culture experiments which have to be undertaken.

Accommodation at the Manjri Farm.

Since the transfer of my Head Quarters from Poona to Manjri a great inconvenience is felt for want of accommodation for my staff. Some suitable permanent arrangement is badly needed to keep the staff contented.

V. A. TAMHANE,
Soil Physicist to the Government
of Bombay, Manjri Farm.

APPENDIX O.

Summary of Work done under the Live Stock Expert to Government, Bombay, Poona, for the year 1924-25.

Charge.—Mr. B. S. Patel remained in charge of duties till 8th November 1924 when Mr. E. J. Bruen returned. The latter worked till 14th April 1925 when he was relieved by Mr. H. G. Baluch to proceed on 8 months leave.

During the year the negotiations and final settlement of the co-operation of the Gowrakshans and Farms at Kandivalee and Mulund were brought to successful issue and an earnest start, the report of which is given under separate heading in this report.

Northcote Cattle Farm, Chharodi.

Mr. V. G. Desai continued to hold the charge as the Manager of the Farm.

Season.—The year under report was very fair in point of rainfall. The monsoon started at the right time and was on the whole well distributed although there were long breaks in the middle, which checked the growth of animals. The total rainfall was 26 ins. 74 cents in 32 days.

Crops—Hay.—The crop on the whole was good and the total grass cut and stacked was 803,461 lbs. at a cost of Rs. 3-2-8 per 1,000 lbs.

In addition the following crops were grown:—

	A.	G.			
Bajri	2	30	3,981	lbs.	dry fodder.
Jowar (Sundhia)	25	8	7,971	„	green.
Jowar (Deshi)	8	26½	3,630	„	dry kadbi.
Elephant grass	0	2½	40,480	„	green.
Lucerne	0	30	7,004	„	green.
Sun-Flower	0	25½	7,059	„	green.
* Jowar (Sundhia)	12	37	946	„	dry.
			185	„	green.
Summer Jowar (Sundhia) ..	0	29	14,325	„	green.

Silage.—In all 377,700 lbs. of grass were pit-ensilaged in addition to 212,527 lbs. of Sundhia and Deshi Jowar, which were chaffed by Pac Ensilage Cutter and blower and put into pucca pits. All mowing was done by the Daisy Reaper and it was found to be very useful and economical owing to the scarcity of labour and the wages round about being very high. It was found that 4 acres could easily be mowed by 2 men with one pair of bullocks.

(* The land was newly opened and the crop was late.)

Livestock.—The following table shows the strength of the livestock :—

Serial No.	Name of species.	Number of animals.
1	Cows adult	166
2	Breeding bulls	5
3	Heifers	66
4	Young bulls	42
5	Male calves	67
6	Female calves	81
7	Working bullocks	52
	Total ..	479

The breeding on the farm shows better signs of improvement in conformation, colour, etc., and it is hoped that the near future generation would be of a better type. Management of cows as to milking and feeding is continued on an extensive scale and the number of the milking animals has gone up to 115 and the total yield of milk in the year is 85,757 lbs. as against 52,740 lbs. of last year. The average monthly milk yield per cow is 208 lbs. as against 140 lbs. of last year. This increase in number of cows specially better monthly average yield gives an idea of what better management does.

The total number of births was 127 (68 males and 59 females) as against 92 of last year with a herd of 479 cattle. This shows that the cows and heifers are calving early and regularly owing to healthy condition due to proper care and nourishment. Many heifers did calve at the age of 4½ years.

Disease.—The foot and mouth disease the ever pest on the farm visited this year as well and almost the whole herd was attacked. The total number of deaths during the year was 22 as against 24 of the last year.

Some 121 animals of all sorts were auctioned for Rs. 2,177 as these were not true to type from breeding point of view.

During the year 8 bulls were put out on Premium System.

General.—The farm on the whole shows good signs of improvement under the management of Mr. V. G. Desai.

Cattle Breeding Farm, Bankapur.

Mr. A. B. Gadagkar was in charge of the farm almost the whole of the year except for 15 days in June when he went on leave.

Season.—The season commenced with light antimonsoon showers but with no subsequent showers and this was insufficient for any growth of grass. However, the situation on the whole was favourable as the subsequent monsoon showers were in time and well distributed.

Crops—Hay.—Andropogon Contortus (spear grass) which prevails on the farm gave good yield this year. It grew to a height of about 3' and was harvested after removing the spears in time.

The harvesting was done by hand labour and the total grass cut from the reserved area was 109,545 lbs. at a cost of Rs. 376-9-0 as against 215,400 lbs. during the last year. In addition to the above 118,730 lbs. of grass were cut green for silage at a cost of Rs. 65. This is the first time that grass from reserved area was cut for silage and the second growth was fed to cattle.

The gradual increase in the strength of the herd and the limited pasturage in the fort area has necessitated to supplement the grazing area and accordingly an area of about 90 acres near Chandapur village about 8 miles from the farm was taken on auction for grazing purposes for Rs.10. This area supported the herd anyhow till the middle of January. Out of this area a part was reserved for cutting hay and the total outturn was 90,455 lbs. at a cost of Rs. 292-11-6.

Livestock.—The following table shows the strength of the livestock :—

Serial No.	Name of species.	Number of animals.
1	Cows adult	59
2	Breeding bulls	3
3	Heifers	30
4	Young bulls	17
5	Male calves	8
6	Female calves	8
7	Working bullocks	6
	Total ..	131

In spite of the cast lot during the last year, the strength of the farm has gone a little over its maximum and the necessity of more housing arrangements is felt. There were 17 births during the year of which 10 were males and 7 females. The herd on the whole shows better signs of improvement both from breeding and rearing point of view and a general look impresses one of the marked characteristic which this breed is known for.

Disease.—During the year under report, Rinderpest made its appearance on the farm in spite of all the preventive measures. It affected 25 animals within 3 days, 7 of which ultimately succumbed. The total casualties were 11 in all. The rest of the herd was segregated and inoculated every 10th day.

Only one bull was put out on Premium System.

Fodder Crops.—A local variety of Jowar was sown in two plots measuring 2 acres 36 gunthas and the yield was 14,213 lbs. which was put into silo. Maize crop was also grown on an area of 1 acre 7 gunthas and gave an

outturn of 16,205 lbs. which was also turned into silage. Besides the above 118,730 lbs. of grass were ensilaged.

General.—No cattle show was held on account of the prevalence of Rinderpest round about the farm.

Willingdon Cattle Farm, Phihai.

Mr. B. B. Jamaspjina was Manager of the Farm till 21st January 1924, when he went on 6 months leave on account of a septic wound Mr. Kotumal J. Advani, a Non-Graduate Fieldman acted in his absence.

Season.—The total rainfall during the year was 4 ins. 69 cents and most of it was in July but the year was not so much favourable. The farm area is known for its pasture but this year it did not give the usual quantity of hay.

Crops—Hay.—Only 14,090 lbs. of grass were harvested. This year again 15 acres of more land was brought under cultivation and green fodder such as berseem, oats, maize and jowar were grown and fed to cattle. The land is being cleared of Kandoo bushes as it is found to cause injuries to the udders of most of our cows.

Livestock.—The following table shows the strength of the livestock :—

Serial No.	Name of species.	Number of animals.
1	Cows adult	39
2	Breeding bulls	5
3	Heifers	32
4	Young bulls	40
5	Male calves	4
6	Female calves	3
7	Working bullocks	11
	Total ..	134

The herd on the whole is making good progress. Out of 35 that finished their lactation during the year, 6 cows gave over 5,000 lbs. of milk per lactation and 6 more over 4,000 lbs. All the yield is exclusive of the quantity sucked by the calves.

Milk Disposal.—The milk was sold at an average price of Rs. 5 per maund. The trouble of carrying the milk to a distance of 13 miles specially across the river with flowing sand bed still exists and cannot be overcome until a pasteurizer is set up on the farm.

General.—There were 37 births during the year of which 19 males and 18 females. The casualties on the farm were 6 in all.

During the year 39 animals of all description that were not true to type were sold at a total cost of Rs. 1,321-6-0 and only one bull was put out on Premium System.

A cattle show was held at Karachi in February. There was a very fine representation of better typed animals.

Livestock and Dairying out-look in Sind.

At present there is one pair of bullocks for 16 acres as against one pair of bullocks actually required for 5 acres of land in proper Presidency and for 7 acres in Sindh. This shows that for progressive cultivation, there is already shortage of as much number of bullocks not taking into account the importation of bullocks from Baluchistan and Rajputana States, which may grossly amount to 1/8th the present number of animals.

With regard to milk supply as calculated, hardly 4 ozs. of milk are available per head as against 20 ozs. per head in United States of America and 10 ozs. in United Kingdom.

After the Sukkur Barrage Scheme is complete there will be in addition to above alarming shortage, the very pressing and imperative need for bullocks and milch cows to an extent of 3½ lakhs of bullocks and nearly as many cows.

Our present provision as an experimental farm at Malir is given in the above statement. It stands to an alarming out-look that a more extensive provision of farms for cattle breeding and Dairying is imperative and urgent if all the land to be commanded under irrigation is to be exploited to best cultural and economical means and a sufficient and healthful provision of milk and its products is to be made for the hard worked tenant and landlord of an extreme hot place as that of Sindh.

Co-operation of the Bombay Gowrakshans at Kandivalee and Mulund.

Introductory.—The Honourable Sir C. V. Mehta, M.A., L.L.B., the late Minister of Agriculture initiated a scheme whereby co-operation can be sought between Government and the authorities of the various charitable Gowrakshans with a view to work for the material welfare of the country and at the same time to preserve fully their own charitable characters and objects.

Accordingly the Livestock Expert visited this institution on 13th January 1923 and submitted his report. On this report a definite scheme was put up and sanctioned in the budget for the year 1924-25. Consequently the work was started at once on the following conditions :—

(1) That the Gowrakshan set aside 20 cows of Gir breed for breeding purposes.

(2) Government also added equal number of Gir cows, *i.e.*, 20 to Gowrakshan and 1 bull.

(3) These 40 cows to be separately kept and managed for breeding purposes and all the necessary breeding and management records are to be maintained.

(4) The Gowrakshan to hand over all the male progeny from these 40 cows to Government for giving out as Premium Bulls.

(5) Government is to pay for the manager at Rs. 150—5—200 and the Gowrakshan to give him free quarters as long as all the work went on smoothly and satisfactorily.

(6) The Livestock Expert and the Economic Botanist to help in their respective branches to the Gowrakshan.

A Manager was appointed in June 1924 and purchases of cattle were finished by the end of December 1924.

At a cost of Rs. 13,000 received from the Trustees of Late Sheth Gordhandas Sundardas, a special cattle shed on the latest approved sanitary principles has been constructed.

An opening ceremony of this institution to be named as "Sheth Gordhandas Sundardas Moolji Jetha Cattle Breeding Farm and Gowshala" was performed by H. E. the Governor of Bombay on 17th March 1925 at Akurli, a village near Kandivalee station on B.B. & C.I. Railway.

Cattle.—Gir breed was selected to form the nucleus foundation stock.

Disease.—Rinderpest broke in, in January and February but none of the breeding cows succumbed to it as inoculations were carried out in time.

Strength of herd.—Kandivalee Gowrakshan.

	Cows.	Calves.		Bull.	Total.
		Male.	Female.		
Government cattle ..	19	9	7	1	36
Gowrakshan's cattle ..	13	5	7	..	25
Total ..	32	14	14	1	61

There were 17 births (11 male and 6 female) during the year.

In all there were 7 deaths in the herd—4 calves out of 17 born, 1 out of the calves that accompanied their mothers and 2 cows—one due to injury in transit and the other by a fall in a feeding trough.

Pasture.—The institution has an area of 1,000 acres in its possession. Out of these 500 acres are on hill and 500 are pasture land but 80 acres of land are reserved for the cattle to graze where they get ample grazing for 5 months.

From the other area 20,000 lbs. of green grass and 80,000 lbs. of hay were cut.

With an intention of fodder growing Wal was broad casted along with Bajri but for want of fencing all of it was eaten away as soon as it sprouted.

Sillage.—87,000 lbs. of grass were turned into sillage at a cost of Rs. 275 and it gave 56,000 lbs. of good sillage, *i.e.*, 65 per cent.

Buildings.—The Gowrakshan has specious buildings for all its needs and 2 pucca silos.

There is also a Veterinary Dispensary maintained with full equipment by the institution itself.

Establishment.—To help the Manager, there is one assistant who inspects the jungle area; besides there is all the menial staff maintained that is necessary.

Feeding cost.—Feeding expenses came to Rs. 6,870-4-3 (Concentrates Rs. 4,911-5-6 and Roughages Rs. 1,958-14-9).

Milk production.—On an average 50 per cent. of the cows were in milk and during the year (from 17th September to 30th June 25) 40,002½ lbs. of milk were produced exclusive of milk sucked by the calves. The average daily yield of a cow comes to 7·7 lbs. The cost of production of 1 lb. milk comes to Re. 0-3-5 including all the overhead charges excepting the pay of the Manager, interest on outlay and depreciation on buildings. The milk is sold at Bombay at Re. 0-3-4 per lb.

	Rs.	a.	p.
Realizations by sale of milk	7,197	5	9
Total expenses for the year	11,936	8	9

Cattle Show.—Along with the opening ceremony, a cattle show was also held and prizes distributed.

General.—The second Gowrakshan at Mulund on G. I. P. Railway comes under this scheme. No separate report is given here as the foundation stock has recently been removed there from Kandivalee.

An Appreciation.—The Honorary Joint Secretaries have rendered meritorious services in bringing about the co-operation, well-organised start and smooth working. They have by their untiring energies towards real, public and livestock welfare set up an example of better utilization of Gowrakshan and public funds. It is expected that various other Gowrakshans throughout Presidency would follow the example of these pioneers.

Mr. T. P. Shah, B.Ag., Manager at Kandivalee has been doing good work.

Propaganda and Village Improvement.

The three Divisional Inspectors remained in charge of their own Divisions all through the year except that the Divisional Inspector, N. D., was deputed for 3½ months to select and purchase Gir cows from Kathiwar State for the Kandivalee and Mulund Gowrakshans and it will not be out of place to mention that he found it a very difficult task to procure best and typical animals as these are very scarce and scattered. The Divisional Inspector, C. D., was also sent out of his jurisdiction in Khandesh to attend to some urgent work as the Divisional Inspector, N. D., had been on a month's leave.

The Divisional Inspectors as usual carried on advisory propaganda, as to the promising results obtained through premium bulls issued and

maintained by Government, the importance of pure type bred bulls and better feeding and care in way of rearing standard stock from the progeny were explained to the cattle owners.

There was a good demand for premium bulls in all the Divisions but the wants for Khillar bulls could not be fulfilled as good bulls are very scarce. It is therefore suggested that the question of opening a farm for this breed will have to be seriously considered. The following bulls were given out on premium system :—

Northern Division	..	8 Kankrej and 5 Khargone.
Central ,,	..	1 Khillar.
Southern ,,	..	3 Krishna Valley, 2 Amrit Mahal and 2 Merino Rams.
Sind ,,	..	1 Sindhi bull.

Cattle Shows.—This year there were 4 cattle shows held for the following breeds :—

Breed.	Place.	Attendance.	Prize money.
			Rs.
1 Kankrej	.. Chharodi (B.B. & C.I. Ry.).	366	440
2 Sindhi	.. Karachi ..	200	951
3 Khillar	.. Mahud Bk. (District Sholapur).	201	427
4 Krishna Valley	.. Athni ..	1,600	372

The Cattle show was held at Karachi on the Commissioner's Maidan and it was the first of its kind held by the Agricultural Department. It is worthwhile mentioning that the show was a huge success. The donations from private gentlemen and public bodies went over Rs. 1,000 and this very fact is sufficient enough to show the enthusiasm and love, which the people in Karachi have for the Sindhi cows and the renovation of this breed will not be far away if they continue to show the same towards this breed, which is so much valuable and known for its high milk yield.

The show at Bankapur Farm (District Dharwar) for Amrit Mahal breed could not be held as Rinderpest was prevailing on the Farm and round about.

Along with the show demonstration of sillage making was shown and it has impressed the cultivators very much.

General.

Publication.—A bulletin on sillage for fodder in Western India was published.

Experimental work.—It has been observed that the usual foodstuffs such as dry kadbi and hay do not contain the necessary phosphates and lime, which are so essential for the growth of livestock and especially of young stock. With this end in view, an experiment of giving *bone meal* for ½ oz. to 1 oz. to calves has been started.

APPENDIX P.

Annual Report.

I was on leave from the 5th of July 1924 to the 14th of February 1925, and during this period my Assistant Mr. Paranjpe acted for me. I have nothing but praise for Mr. Paranjpe as he worked very hard and had to run a difficult Department during a very difficult period.

My Boring Overseer and Shop Superintendent also did well and I must admit that the three of them are hard working and conscientious men and deserve all the praise and encouragement that can be given.

Before going on leave I had drawn out a large programme of work in consultation with Mr. Main, the then Director of Agriculture, to be attended to, during my absence on leave as far as possible, in addition to the general routine work. Some of the principal works were as given below :—

1. Modification of 12 Cawnpore boring machines for adapting them for rock, including the training of men to operate them.
2. Conversion of six Musto Patent hand machines into Power Units including the training of men.
3. Completion of the Karajgi Power Baling Plant.
4. Overhaul of the 15-27 Case Tractor and Plow.
5. Running of Nangaon Pumping Plant.
6. Erection of a steel shed for housing the Famine Sets.
7. Repairs and overhaul to the Ingeco engine on Musto Patent Power Machine No. 7 in the South Division.
8. Repairs and overhaul to the Pumping Plant on the Septic Tank in the Agricultural College compound.
9. Fixing of the Pulsometer and Worthington steam pump on the Experimental Well with live steam-pipe line from the Boiler including testing. Mr. Paranjpe had not only completed all the works specified in the programme systematically and with great economy but also did several other jobs in addition with equal thoroughness.

I had reserved the subject of improvement to implements for myself as I treated it as a personal section of work and hence very little was done during my absence, but I was not idle whilst on leave as I visited many farms and works with a view to see how work was done under English conditions and also to investigate the possibilities of manufacturing implements in England for Indian condition.

Since my return from leave I have been able to get the work on a more substantial basis and the following work has been done and is in progress.

In Sind the orient plow is considered to be the most popular all round plow of any that has been tried and during one of my tours I saw the plow tested and was informed by Mr. Main that there would be a

tremendous demand if only the cost could be reduced, and he gave me the figure of Rs. 20 as the maximum (the present cost being Rs. 32) so I spent considerable time on this implement and have succeeded in making a plow similar in every respect to the orient and can put it on the Market for Rs. 20. A sample plow at Rs. 20 has been sent to Sind for trial and I shall in a subsequent report be able to describe its performance.

I have also taken up the question of plow shares and have designed a C. T. 2 plow share to be made in two parts, the wing part or body of the existing share is subjected to very little wear and tear but the point is worn away in a very short time. So I am having it made in two parts the point being manufactured from my own formula. My aim is to be able to renew the point for the sum of annas four to six instead of having to spend Rs. 3 every time for the complete share. Messrs. Kirloskar Brothers have very kindly undertaken to produce the article according to my design and formula.

Another important implement is the seed drill and I have been working on this for some considerable time.

Mr. Gilbert when Deputy Director of Agriculture, South Division, Dharwar, requested me to design an appliance to attach to the ordinary seed drill which should be worked by hand. This has been done and the drill tried on the College Farm, but although the appliance when worked regularly gives good results, we find the operator forgets to turn the handle so I am now fitting up the drill to be worked mechanically and with this give it another trial. Other implements which I have taken in hand are as under for the several Agricultural Officers.

Officers.	Particulars.
Deputy Director of Agriculture, S. D., Dharwar.	Seed drill for Jwar and Cotton ; Turnwrest Plow 6 to 9″ ; Portable Power Chaffcutter for Kirbi; Portable Jwar threshing machine.
Deputy Director of Agriculture, Sind, Karachi.	Plows improved wooden, light iron, for dry and moist land work. Improved water lifts for bullock power. Winnowing machines for cereal crops. Threshing machine for cereal crops. Seed drills suitable for wheat, cotton and other cereals Rollars. Reapers for unirrigated wheat.
Deputy Director of Agriculture, S. C. D., Poona.	Reaper for Jwar and Bajri. Power driven water lifts for 30′ to 40′ head, with a capacity of 2,000 to 2,500 gallons per hour. Plows with special beams and hitches suitable for bullock power.
Deputy Director of Agriculture, N. C. D., Nasik.	Seed drill for different grains and with an arrangement for variable depths. Improved Plow. Harrow for collecting weeds, cotton stalk, etc.

Officers.	Particulars.
Deputy Director of Agriculture, N. C. D., Nasik.	Cotton stalk remover. Groundnut harvesting and preparation implement. Chaffcutter for Jwar. Intercultural Hoes. Hand Implements for gardens and vines.
Deputy Director of Agriculture, Konkan Ratnagiri.	Small handy tractor for salt lands. Implement for puddling of rice. Bullock power clod crusher. A small water-lift useful for small holdings, and more economical than any in use. A cottage home fruit canning apparatus for Apples and Mangoes. Improvement in packing of Mangoes. Improvement in Meston Plough.
Deputy Director of Agriculture, Gujarat, Surat.	Cotton stubble digger for bullock power. Cotton picking machine. Improved shares for plows. Rice, wheat and jwar threshers suitable for bullock power. Rice, wheat and jwar threshers suitable for engine power mounted on one frame. Light Winnowers for above for bullock or manual power. Portable power chaffcutter. Motor Tractor for Surat soil.
Professor of Agriculture, Poona.	Seed drill with feed, rate and distance regulator and capable of dealing with mixed crop if possible. Improvement in Knight Churchill Kolpa. Winnower. A groundnut digger. A blade harrow which will not pack the soil. A cheap and reliable groundnut sheller for seed purposes. A ridging plow attachment. Disc Plows. Manure spreading attachment to a bullock cart. Treddle power cotton gin similar to a sowing machine.

This work involves much of the personal element, and I am afraid my other duties are not allowing me the time required to make real progress in this direction. I realise how very important this matter is, and I am only too anxious to get the very best results, but I am afraid the true significance of the responsibility of my entire work is not known. Take for instance the boring. I am technically in charge or soon shall be of 86 boring machines, 46 of which will be power driven and 15 of those of the F 3 Power Calyx type; the latter number being the full compliment of the Executive Engineer in charge of Boring, Nasik, who has two European Assistants and no other branch of work to attend to, whereas in my case I shall have many more machines than he, and in addition I am technically in charge of the following works.

Workshops and Experimental Well, Training of oil engine students, Nangaon Pumping Plant, Karajgi Shreading and Baling Plant, Tractor

experiments throughout Bombay Presidency including Sind, River Surveys throughout Bombay Presidency, Hire of Pumping Plants, Famine Pumping when required, Official and technical correspondence for all and sundry, and last but not least Improvements to Implements for the Presidency including Sind.

I shall now turn to a few detailed activities of the Department.

Advisory.—During the year under report we had 31 inquiries for pumping, 3 for cane crushing, 8 for tractoring, 2 for ginning, 86 in oil engine driving and several for site surveys, general advice and estimates for machinery. 15 Sites have been actually surveyed and 12 detailed estimates for different kind of machinery supplied to the parties concerned. 27 Students were admitted in the oil engine class attached to the Shops, out of whom 27 were successful.

Executive.—The Shops were very busy from the beginning on different works. Materials for the steel shed sanctioned under Government Resolution, Revenue Department, No. 9325 of 28th November 1923 for housing the Famine Sets were ordered from Dapuri Works during the previous year, and the actual erection of the shed for which no funds were available and for which Dapuri Works demanded Rs. 1,365 had to be done departmentally with a view to minimise expenditure and manage within our limits. The Shed built is 100 feet long and 26 feet wide and 14 feet to the eaves divided into 8 equal bays each of which is now devoted to an individual Famine Set. The adaptation of 12 Cawnpore machines and the conversion of 4 hand machines into power units sanctioned in Government Memo. No. 8353A of 31st March 1924 "43-Famine Relief" was taken in hand next, in addition, the conversion of 2 more machines received from the Deputy Directors of Agriculture, Konkan, and Gujarath. It was not advisable to entrust these works to an outside-shop, as the machines were in an experimental stage and required a good deal of modification which had to be based on practical experience.

Eight Cawnpore machines were already scrapped from the Nadiad Boring Department and a later idea was to modify them for making very shallow bores (say 50 feet deep) for exploratory work in Famine-stricken areas. The idea was ultimately accepted as a good one and developed into an order from Government to do the work. Accordingly all the parts of these machines were brought into Poona, details of necessary alterations and modifications worked out and 12 improved machines (practically built on new lines entirely different from what they were before) each having a substantial girder frame, a complete set of rock boring tools, a crab and winch, set of smith's and fitter's tools, a forge, etc., were produced and five of them sent out to Jategaon 25 miles away from Poona, partly for experimental purpose and partly for training of mukadams.

As regards conversion of machines we had received 1 from South Division, 2 from Gujarath, 1 from North Central Division, and 2 from Konkan, out of which all, with the exception of the two machines in Gujarath, were converted in Poona, and the rest at Surat and Nadiad

respectively by sending along a Departmental mechanic. Each of the converted machine was fitted with an oil engine, a countershaft with belt striking gear, new cam shaft of ample size, new bearings, a widened winch, stays and tension rods, rotary circulating pump with a suitable cooling tank and connections and continuous derrick legs. The training of men to operate these machines was done during the work of conversion without additional staff and extra expenditure.

The Deputy Director of Agriculture South Division sent one 6 B. H. P. Ingeco engine belonging to Musto Power No. 7 machine for repairs and a thorough overhaul. He also wanted to have the main and big end bearings made of gun metal in place of the white metal bearings and a spare set of each supplied for stock purposes. Considerable time had to be spent at the shops on this job to see whether gun metal bearings could be introduced with advantage and ultimately after a good many trials the idea had to be given up on account of the constructional design of the engine being unsuitable for the purpose. The engine was therefore returned duly overhauled and refitted with white metal bearings.

The Pumping Plant on the Septic Tank at the Agricultural College, Poona, required repairs and were undertaken at the request of the Professor of Agriculture without any detriment to its daily work for which it has been installed. This work should rightfully have been sent to the Deputy Director of Agriculture, South Central Division, Poona, for being attended to by his Mechanical Assistant but as the work involved a good deal of machining and as it was inadvisable to stop the plant for even a day we had to undertake the work.

Plants on Hire.—During the year under report the Department had sent 9 Pumping Plants on hire to the various cultivators noted below partly for sinking and deepening existing wells and partly for irrigation purposes.

Name of Cultivator and place.	Description of Plants.
1 Mr. P. N. Bhide of Wadgaon, District Poona.	4 B.H.P. Kerosine engine and $2\frac{1}{2}''$ centrifugal pump both mounted on a special girder frame with piping.
2 Mr. S. V. Supnekar of Supna, District Satara.	14·4 B.H.P. Clayton Crude oil engine.
3 Mr. B. V. Wadkar of Manjri, District Poona.	7 B.H.P. Tangye engine and 3″ centrifugal pump with piping both mounted on a girder frame.
4 Mr. R. N. Agte of Lawacha, District Surat.	16 B.H.P. Tangye engine and 3″ Ruston centrifugal pump with piping, etc.

Name of Cultivator and place.	Description of Plants.
5 Mr. Sorabji Rustomji of Manjri, District Poona.	6·7 B.H.P. Wizard engine and 2½″ centrifugal pump with piping, etc.
6 Mr. N. S. Patil of Wadgaon, District Nasik.	2½″ Swaby centrifugal pump with piping, etc.
7 Mr. T. R. Chiplunkar of Naigaon, District Nasik.	14 B.H.P. Blackstone oil engine and 3″ Tangy's centrifugal pump with piping, etc.
8 Mr. Bhausahib Jadhav of Vagholi, District Poona.	4 B.H.P. Blackstone engine and 2½″ centrifugal pump with piping, etc.
9 Mr. R. K. Saswadkar, Poona.	7 B.H.P. Tangye engine and 3 Tangye centrifugal pump with piping, etc.

Out of the above plants No. 8 and 9 have been re-hired to the parties concerned. All the other plants with the exception of No. 3 and 9 which are retained for the current year have been returned by the cultivators concerned and revenue actually received before 1st April 1925 amounted to Rs. 1,697-0-5 on this account.

Nangaon Pumping Plant.—The pumping plant at Nangaon Peta Dhond, District Poona, on river Bhima has done very well this year. It was run for 283 days in the year, at 12 hours run for 231 days and at 24 hours run for 52 days and realized about Rs. 4,331-2-0 as water charges on a total acrage of 358 acres. The nett expenditure including the stock on hand on the 1st April 1925 amounted to Rs. 10,025-0-10 against Rs. 12,613-3-10 during the previous year. The amount of deficit is correspondingly reduced and when the water charges are increased to suit the actual expenditure according to the new organisation proposed to Government it is hoped that the plant will make two ends meet:—

Drawing and Designs.—About 50 drawings and sketches of different machines and parts have been made in the drawing office including 8 designs and working drawings for the following plants in particular:—

1. Pumping plant for the Court of Wards Hyderabad Sindh, consisting of a 10 B.H.P. Blackstone Crude oil engine and 6″ Pulsometer Centrifugal Pump fixed on a well situate on a canal, with piping, etc.

2. Standard drawing for a Musto Patent Hand Boring Machine converted into power machine.

3. Steel trolley for a 5″ Power Calyx Drill for Konkan Division.

4. Pumping plant at Alandi comprising a 2″ Worthington Plunger Force Pump, a 9 B.H.P. Blackstone engine, a 16″ Grinding machine, a Dynamo for lighting with countershaft, etc.

5. Pumping plant for Mr. Chaudhari of Faizpur consisting of a 16 B.H.P. Robson Crude oil engine and 4" Centrifugal Pump complete with piping, etc.

6. Pumping and Ginning plant at Government Farm Surat comprising of 13 B.H.P. Tangye engine, a Ohio Power Chaffcutter, 2 rollar gins, a Flour Mill, one 3" Centrifugal Pump with piping, countershaft, etc.

7. Modified Cawnpore Boring Machine.

8. Modified Seed Drill Box.

Tractoring.—The old 151—27 Case Tractor and the Grand Detour 3 furrow plow were sent to Shevgaon Taluka in Ahmednagar District about 40 miles from the railway station for plowing purposes soon after the machines were completely overhauled at the Shops. The work was actually started on the 16th of January 1925. The tractor worked splendidly in the beginning but the plow gave a lot of trouble. When working with the three bottom the main axle used to bend and when one bottom was taken off it was found very difficult to keep the tractor on the land. There was another difficulty of the plow going too deep irrespective of its adjustment and the result was the shearing of one of the axles. The difficulty was unltimately overcome by introducing an idle or guage wheel to support the frame. All this took some time as there were very few or practically no facilities at site or any where near to undertake this work. Plowing was again resumed on the 27th of January 1925 and from that to the 26th of March 1925 the land plowed amounted to 91 acres 26 gunthas. Then the tractor began to give trouble and closed down the operations entirely. The differential gear Bull Pinion and rear axle broke while working and as they were not available in Bombay and could not be imported within a reasonable time the tractor had to be brought to Poona for repairs.

In short out of 56 days, the tractor worked for only 38 days losing 4 days as holidays, 12 as stoppages due to small breakdowns and 2 in shifting from place to place. The revenue realised on the work amounted to Rs. 733-3-3 at Rs. 8 per acre while the total receipts including this amount and some arrears of the previous year amounted to Rs. 2,499 by 1st of April 1925. I admit that the work turned out should have been much more. There are however several reasons for this slow progress. I have already reported that the tractor is old and constructionally defective and cannot compete with the latest and greatly improved models. Secondly the place where I was asked to conduct plowing operations was far away from my Head-quarter and 40 miles from Ahmednagar. There were very few facilities for repairs or resource in case of breakdowns and consequently a good deal of time had to be spent in obtaining parts and executing repairs from Poona. The operators had to be left practically to their own resources as it was impossible to give them close supervision and hence the work turned out was naturally slow. There is certainly a very great demand for these machines and it is very essential that different makes are tried in different localities or divisions under close supervision with different types of implements in order to ascertain their capacities on different soils and in different tracks. This

problem has been pending a long time and unless we have at least one set of an improved type working in each division we shall not be able to get accurate data as regards their usefulness in plowing as compared with bullock power. As regards implements there is a great difference of opinion, some advocate Mould Board Plows, while others prefer the Disc Plows and contend that the latter will break the soil under the most severe conditions. Our actual experience however proves the reverse. Of course there are several other factors which affect progress to a great extent. For instance the moisture in the soil, the nature of land and its conditions in different temperature, the local conditions and the way the machines are handled are some of the chief factors which play an important part in the success of tractoring apart from the right selection of implements. Then again it is essential to give some incentive like a bonus to the drivers handling these machines for the sake of obtaining more work and taking due care of their machines. A permanent man of this class is not so satisfactory as it matters very little to him what the progress is.

Karajgi Plant.—The Power Bruising and Baling Plant at Karajgi in Dharwar District was started in the first week of February 1925 for regular work and stopped by the 10th of June 1925 after finishing all the Kirbi purchased by the Deputy Director of Agriculture, South Division. The bales turned out after passing through the bruiser and then through the hydraulic press amounted to 6,409 ranging in weight from 80 to 100 lbs. according to density. All the machines with the exception of the Bruiser worked splendidly throughout the season without any stoppage of any kind. The Bruiser however gave trouble from the very beginning. Breaking of knives was the chief offence which was so frequent that the progress was very low during the first few weeks. Moreover the men were entirely new to this line of work and the continual breaking of knives and consequent stoppages made them nervous instead of getting them familiar and confident with the various operations. There was not sufficient Kirbi at hand to train the men before starting the operations and when it actually arrived at site it was full of stones and stones are fatal to this class of machine. Ultimately the matter had to be investigated with the help of the Maker's expert and the conclusions arrived at were that some of the Kirbi received was exceptionally hard and that the machine should be fitted with stiffened knives in order to overcome the difficulty. We expect to get these fitted before operations start next season and with the present arrangement to keep out stones I anticipate a good seasons work.

The machines have been tested individually many times and found to be turning out much more than the specified quantity. Therefore if the Bruiser works smoothly and keeps a constant feed to the press the plant can easily turn out more than the specified output. Secondly the coolies we get in the vicinity do not attend the work before 8-30 in the morning and leave before 5-30 in the evening. Consequently we have not been able to run according to estimate. I hope, however, to get the matter greatly improved next season.

Famine Boring.—Amongst the several activities of this department Famine Boring Scheme has added immencely to our works, both executive and office routine. The Devolution Scheme had relieved me of some responsibilities but the Famine Scheme has again added to them. I was immediately required to work without extra help 8 boring machines in Nagar and Sholapur Districts in connection with the Famine work in addition to the purchase and trial of 45 hand machines, 10 Power machines and training of sufficient staff for operating them. My principal men are simply overtaxed and it is high time now to take this matter seriously. The work turned out by the eight machines during the last few months with entirely raw men placed on newly modified machines without giving them a fit training, strange strata, and distant location of the machines from each other and also from a railway station, has been given in the attached statement. When these facts are taken into consideration it will be seen that the work turned out is certainly as much as could be expected in the circumstances.

The balance of power machines is yet to arrive and when they are received each of them will have to be fitted with extra equipment to meet local conditions and then sent out in the district. In short this extra work is likely to continue for over 12 months until we get the whole scheme going and all the machines are put into action with the requisite number of trained staff.

I submit that it is impossible to run all the above works successfully, give them proper supervision and work out the improvement of implements as it should be done with only one Indian Assistant. The work and duties involved are sufficient for three or four men and I shall be glad if Government will kindly consider the matter and sanction the necessary assistance to carry on this important branch of agriculture.

W. M. SCHUTTE,

Agricultural Engineer to
Government, Poona.

Statement of particulars of bores made

Serial No.	Survey No. in which bore is made.	Taluka.	Village.	Diameter of of bore.	Depth of bore.	Water before boring in gallons per hour.	Water after boring in gallons per hour.
1	S. No. 138 ..	Shrigonda ..	Limpangaon ..	4″	70′	*Nil.*	20
2	Do. 121 ..	Do. ..	Pimpri ..	3″	60′	*Nil.*	Negligible quantity.
3	Do. 103 ..	Do. ..	Do. ..	3″	52′	*Nil.*	200
4	Do. 13 ..	Do. ..	Shrigonda ..	4″	50′	*Nil.*	24
5	Do. 241 ..	Do. ..	Limpangaon ..	3″	73′	*Nil.*	*Nil.*
6	Do. 241 ..	Do. ..	Do. ..	3″	55′	*Nil.*	*Nil.*
7	Do. 1057 ..	Do. ..	Shrigonda ..	3″	48′	*Nil.*	Very small quantity.
8	Do. 349 ..	Parner ..	Parner ..	4″	52′	*Nil.*	12
9	Do. 570 ..	Shrigonda ..	Kalgaon ..	3″	40′	*Nil.*	*Nil.*
10	Do. 138 ..	Do. ..	Chikhali ..	3″	49′—6″	*Nil.*	200
11	Do. 499 ..	Parner ..	Parner ..	3″	50′	*Nil.*	18
12	Do. 129 ..	Shrigonda ..	Ghargaon ..	3″	50′	*Nil.*	*Nil.*
13	Gavthan ..	Do. ..	Chambhurdi ..	3″	41′	*Nil.*	4
14	S. No. 101 ..	Parner ..	Vaghunda ..	4″	89′—6″	*Nil.*	3·75
15	Mamlatdar's office ..	Sangola ..	Sangola ..	3″	116′—6″	*Nil.*	Very little water.
16	At Mr. Bhosekar ..	Do. ..	Do. ..	3″	107′	*Nil.*	Do.
17	At Mr. Gulmure ..	Do. ..	Do. ..	3″	104′—6″	*Nil.*	*Nil.*
18	S. No. 193 ..	Shrigonda ..	Chikhli ..	3″	34′	..	..
19	Do. 786 ..	Do. ..	Chorwadi	3″	24′	..	..
20	Do. 101 ..	Parner ..	Vaghunda ..	3″	27′	..	..

In addition to the above 7 bores have been made at Jategaon Kharda for a Dam Project

by this Department in the year 1924-25.

Departmental charges.	Labour charges, oil, coal, etc.	Total cost of boring.	Average cost per foot.	Remarks.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
7 7 0	111 12 0	120 3 0	1 11 6	Unsuccessful.
....	120 8 0	120 8 0	2 0 1	Do.
56 0 0	140 0 0	196 0 0	3 12 3	Successful.
10 12 0	71 1 0	81 13 0	1 10 2	Unsuccessful.
Nil.	149 13 6	149 13 6	2 0 10	Do.
Nil.	119 14 6	119 14 6	2 2 10	Do.
3 0 0	137 12 0	140 12 0	2 15 0	Do.
72 12 0	123 10 0	196 6 0	3 12 5	Do.
15 8 0	198 0 0	213 8 0	5 5 4	Do.
56 12 0	151 9 6	208 4 6	4 2 8	Successful.
27 15 0	179 0 0	206 15 0	4 2 3	Unsuccessful.
5 12 0	193 0 0	198 12 0	3 15 8	Do.
15 0 0	154 6 0	169 6 0	4 2 1	Do.
27 1 0	239 1 0	266 2 0	2 15 3	Do.
Nil.	156 7 9	156 7 9	1 5 5	Do.
Nil.	100 0 0	100 0 0	0 15 0	Do.
Nil.	145 0 0	145 0 0	1 6 1	Do.
....	....	....	....	On hand.
....	....	....	....	Do.
....	....	....	....	Do.

to Yel river making a total of 134'—9".

W. M. SCHUTTE,
Agricultural Engineer, Poona.

APPENDIX Q.

SUMMARY OF WORK DONE UNDER THE HORTICULTURIST TO GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1924-25.

Changes in the staff.—Mr. G. S. Cheema, Horticulturist to Government went on leave from the 20th April 1925 and Mr. H. P. Paranjpye, District Horticultural Officer is acting in place of Mr. Cheema. Mr. P. G. Joshi was acting District Horticultural Officer from that date to 31st May 1925 when he went on leave owing to illness. Mr. Dani has taken his place.

Financial conditions for the year 1924-25 are as follows :—

	Sanctioned grant.	Expenditure.	Receipts.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
(1) Office of the Horticulturist including District Horticultural Officer, Poona	2,003 0 0	2,003 0 0	....
(2) Ganeshkhind Botanical Gardens ..	8,030 0 0	7,693 11 7	1,083 12 9
(3) Modi-Bag, Agricultural College ..	7,587 0 0	7,587 0 0	2,813 7 6

Teaching.—As usual the teaching to the College students was conducted by the Horticulturist with the help of a Demonstrator. Besides this there were four Short Course students in addition to four students in special horticulture. The annual class in Elementary Arboriculture was held in November 1924 by the District Horticultural Officer and six men deputed by the Public Works Department and District Local Boards received training.

Laboratory Investigations.

Fig-drying.—The process of fig-drying recently introduced has attracted considerable attention of the public and particularly of the newspapers both in English and Marathi in which articles have appeared on this subject as well as on kindred horticultural matters.

Jelly-making.—When it is not possible to dry figs in the sun owing to rains, the figs which are very cheap at that time, can be profitably used for jelly-making. The fig jelly is a very beautiful product and is likely to command good market. Similarly *Jambul* fruits which are produced in large quantities can be used for jelly-making. The jelly of *Jambul* fruits however does not become, as far as this year's trials show, as hard as fig jelly. Guava fruits which are very cheap in the rainy season can be economically used for jelly-making. Guava jelly has a great future as guava and lemon fruits are equally cheap in the rainy season. Similarly marmalade from Citron peel can be very economically prepared. Certain other fruits are under investigation as to their suitability for jelly-making. In addition to various uses to which the mango fruit is popularly used, it can be used for mango-butter-making.

Dehydration of vegetables.—Drying in special ovan or dehydration of vegetables has been tried on a fairly large scale. Cabbage, Cauliflowers, brinjals can be dried very nicely and if they are blanched or dipped in hot water for about three minutes, they keep their original colour. Before use the dried stuff must be kept in hot water for half an hour when it assumes its natural form and can be cooked in the usual way.

Drying of banana.—The Rajeli variety of banana commonly grown at Bassein is pre-eminently suited for drying. In the Deccan and Karnatak the Rajapuri or Gujarath-bali variety is very largely grown. This type also can be dried into a nice marketable product when the fruit is full ripe and fit for table use.

Cold Storage Experiments.—In the mango season a small attempt was made to test the keeping quality of mango fruits in the Cold Storage in the Crawford Market, Bombay, where mangoes were kept in a temperature varying from 36°—40° F. It was found that the Alphonso mango is the best suited variety. The Pairi is a bad keeper in the cold storage as it is outside it. Fruits intended for ripening after being taken out of the Cold Storage should be perfectly developed on the tree before they are plucked. Fruits should be wrapped in thin tissue papers and tightly packed in many layers in ventilated boxes. Unwrapped fruits quickly suffer from a sudden drop in the temperature of the Cold Storage. At a uniform temperature between 38° and 40° F. green and raw Alphonso mangoes keep nearly for a month in the Cold Storage. Ripened or half ripened fruits are more liable to be influenced by a sudden drop in the temperature than the green and raw fruits. With a little higher temperature than 40°F. Alphonso fruits will probably keep longer, than a month.

Experiments with mango packing.—In the usual commercial methods of packing mango fruits it has been found that fruits packed in trunks are as liable to damage in transit as those packed in baskets or those carried on head loads in suburban trains. The percentage of fruits damaged in transit ranges from 34—37 per cent. More improvement is desired in handling the mangoes while harvesting and loading on board the steamer rather than in actual packing them in baskets. About 10 per cent. of the fruits are packed immature so that they cannot be ripened satisfactorily. Not more than 20 per cent. of the fruits develop a really attractive colour. Sucking insects were mainly responsible for the dull and disfigured rinds of ripened fruits.

This year's experiments in mango packing indicate that bamboo baskets arranged in a deal wood crate are found to be better packages than loose baskets unprotected from outside. The crate protects the fruit baskets from the rough handling at railway stations. But it will not pay the exporter to pack mango baskets in returnable crates unless they are cheaply manufactured in large numbers and facilities are given by railway authorities to return the empties at a nominal charge. To make any sort of improved packing a success, sympathies of railway

authorities are greatly desired to carefully handle the packages particularly on junction stations and transport them to their destination in as short a period as possible.

Modi-Bag.

Season.—The cold season was abnormal and on the 23rd of January 1925 the thermometer dropped down to 33·5° F. Young leaves of banana, papaya, grape, were frosted but afterwards the plants revived. The development of young fig fruits was considerably retarded and the fruits never came up to the normal standard. Tomato and brinjal crops were permanently damaged, while citrus, guava, pomegranate, chickoo and mango trees were not affected at all.

Fruit trees.—Cultivation expenses, maximum and average yields of various kinds of fruit trees, particularly of fig, pomegranate, papaya and banana have been worked out. The two varieties of fig imported from Baghdad yield very sweet and soft-seeded fruits in large numbers. The crop however does not develop to its normal size and many fruits fall prematurely. From the last two years' trials we can definitely say that the Dholka or white and soft seeded pomegranate can grow successfully in the Deccan. This is a late variety but is much superior to the local one.

Out of the seedlings grapes of the Pandhari Sahebi variety the vine No. 35 has given promising results both as regards quality and quantity. The bunch is compact, with berries long, seeds few and skin thin.

Mango budding.—So far budding of mango plants is not appreciably practised in India. A special effort was made this year to bud on mango stocks two years old and as a result 35 budded mango plants are now ready in the Modi-Bag.

Seasonal planting of banana.—From experiments in seasonal planting of banana suckers (Rajapuri variety) it appears that suckers of this variety may be planted from the end of February to March or from August to December. Planting in March or April results in early flowering. Pruning of all the suckers to the ground every month till the harvest of the mother plant has given excellent results so far as the yield is concerned. Sword suckers are always considered the best for planting purposes but broad leaved suckers when given better treatment give equally good results as the former.

Ganeshkhind Botanical Gardens, Kirkee.

Packing of mango plants for long distances.—After three years trials at packing fruit plants for despatch by post to long distances, it has been found that grafted mango plants can be safely sent by post to any part of the British Empire which can be reached by 48 days' journey at a cost of Rs. 4-8-0 per plant excluding price of the plant. Similarly plants can be sent by post to any part of India which is not easily accessible by railway or by steamer.

Bananas from seed.—The fruit produced by a banana plant (Sonkel Chanda variety) raised from seed was of a poor type practically without any pulp but at the same time without any seed in it. A sucker from a seed plant gave a bunch of 57 fruits which were without seeds in them, somewhat better than those of the seed plant, but are not up to the standard of the normal type.

Guava trees.—The cultivator never prunes the guava tree for fruit bearing. The only method that he follows is to bend the branches every alternate year, so that the mature wood of the branches becomes horizontal. Fruit appears on the new growth which is formed on the arch of the branch, thus formed. If the tree is pruned it appears to produce much better fruit, the number of which is reduced by about 11 per cent. and the weight is increased by 30 per cent. per acre.

District Work.

Last year important inquiries were made into the question of marketing of mango fruits by a Committee appointed under Government Resolution, Revenue Department, No. 947-24, dated 15th May 1924 of which Mr. Cheema, the Horticulturist to Government, was the President. The findings of the Committee are embodied in a Report submitted to Government.

A scheme for development of the Fruit Farm at Mirpurkhas is now drawn up.

The nursery at Dharwar was very successful. In all over 800 grafts of various types principally Alphonso, Pairi and Mulgoa have been made. Besides these, 6,000 mango stocks are raised and will be ready for grafting upon in the next cold weather. In addition to these 75 chickoo plants are also propagated. All this is a great asset to the District Agricultural Association for whom the nursery was started. Several renovation and improvement works were undertaken for the public.

Gummosis of the mosambi tree is prominently coming to the notice and various calls for its treatment are being met with in collaboration with Mycological Section. Gardens at Baramati, at Nanded in Haveli Taluka and at Mangrool-Pargaon in Junnar Taluka were treated.

An experienced fieldman was deputed to Mirpurkhas Farm to propagate plants on a large scale to meet the demand for plants from the public as well as to keep a sufficient stock ready for planting when the Sind Scheme for Horticulture is sanctioned. Unfortunately the fieldman had to revert to Poona within three months owing to ill-health but during the three months he could do considerable useful work in the propagation of various fruit trees.

In September 1924 the well known pomegranate gardens of Alandi village and near about to the extent of 236 acres were severely infested with a large caterpillar of Ophiusa melicerta which devoured every leaf of the plantation. A garden at Alandi consisting of 1,500 trees was taken in hand to demonstrate eradication of the pest in consultation with the Entomological Section.

Drying of green figs was demonstrated to the public at Satara and at Bhose near Miraj in May 1925.

During the year under report 394 enquiries were received of which 15 were from foreign countries regarding various matters connected with fruit trees. Many of the correspondents gratefully acknowledged our help and the manner in which we solve their difficulties.

H. P. PARANJPYE,

Acting Horticulturist to Government

of Bombay, Poona.

APPENDIX R.

Summary of work done by the Inspector of Agricultural Schools, B. P., Poona, for the year 1924-25.

Preliminary.—The post of the Inspector of Agricultural Schools which was kept in abeyance was revived from 1st June 1924 owing to the neccessity of the post on account of introduction of an alternative agricultural syllabus in the higher standards of Vernacular Primary Schools. The charge was held by Mr. R. Y. Hulkoti, B.Ag., from 26th June to 16th November 1924 and by Mr. K. M. Pawar, B.Ag., for the rest of the period under report.

Nature of work.—The work has mainly been of an advisory nature both in connection with the Vernacular Agricultural Schools and the Agricultural classes attached to the Vernacular primary schools. The former schools are controlled by the Deputy Directors of Agriculture, while the latter are controlled by the Deputy Educational Inspectors. In certain cases, the Inspector has to act as an *itinerant teacher* and give model lessons for the guidance of the teachers. More attention had to be paid in connection with the training of teachers for agricultural classes and supervision of agricultural classes.

Vernacular Agricultural Courses.—The object of the agricultural schools differs from that of the agricultural classes attached to the primary schools. While the agricultural schools aim at training adult sons of genuine agriculturists within certain restrictions as to age and educational qualifications with a view to enable them to go back to their farming and help their parents in increasing the yield both from land and livestock by improved methods of agriculture in so far as they are applicable to their conditions of environment, the latter (*viz.*, the agricultural classes) aim at adapting the rural education to rural needs as far as possible and making the boys good citizens and also at preparing the minds of boys in the primary schools irrespective of age for manual work which is so very essential for removing the current prejudices of the agricultural public regarding the object and utility of education and inducing the boys to go back to their professions which have greatly suffered owing to the tendency of boys to look down upon their professions and the consequent disinclination for physical labour which forms a very important factor in the successful undertaking of agricultural industry under the present environment. The alternative agricultural syllabus has been framed so as to suit the above object and the boys reading for this course have all the privileges of the ordinary Vernacular Final Examination. In the absence of the Agricultural Classes, both these objects had to be achieved by the agricultural schools though at a greater pecuniary cost to Government, when compared with the efficiency of the product obtained, and the syllabus framed had, of necessity to be in accordance with these two objects and has therefore been more elementary. But since an alternative agricultural syllabus has been introduced into the Vernacular primary standards, the course of the Agricultural schools will have to be revised in the near future with a

view to make the course a purely practical one and thus make it more appealing to the genuine agricultural public, and attract their boys to the Agricultural Schools in greater number.

With the opening of the agricultural classes in the primary schools, the initial burden of training the requisite number of teachers for the experimental agricultural classes has fallen on the agricultural schools which have therefore been part-time vernacular agricultural Training Colleges. A provisional syllabus has been framed so as to suit the needs of the present second year passed teachers who are now temporarily recruited to take up the agricultural teaching work in the primary schools. It is evident that a separate Training College syllabus will have to be introduced when the recruiting of such teachers will be stopped after the boys from the agricultural bias classes become available as they are expected to *have more aptitude for this type of work* owing to their systematic training in manual work from their very young age. The work of the agricultural teacher will be more facilitated if the Nature study syllabus approved by Government for primary standards I to V be regularly taught in all the primary schools irrespective of whether these schools have agricultural classes or not.

Number of Agricultural Schools.—There are six Vernacular agricultural schools in the presidency proper, one in each of the Agricultural Divisions except Gujarath which has two. Of the six agricultural schools, Dhulia and Surat schools have mainly been the out-come of local aid and enthusiasm, though other schools too are aided to some extent by Local Boards and private bodies.

There seems to be some genuine demand from the public for more agricultural schools. But as it is found advisable to wait till the introduction of the new alternative agricultural syllabus takes deep root in the rural environment, the acceptance of the offer has been postponed. With the development of the agricultural classes in the primary schools, it may be possible to cut short the present period of the agricultural school course and increase the number of agricultural schools practically with the same recurring expenditure now incurred on our schools.

Number of Agricultural Classes.—There are at present 34 agricultural classes which have been at work in the various parts of the Presidency of which 18 have been at work varying from one to two years.

The *number of boys* in the different *agricultural schools* is as shown below :—Loni school in Poona District 36, Devihosur school in Dharwar District 24, Ambali school in Panch Mahals 31, Jambhul school in Thana District 22, Dhulia schoool in West Khandesh 22, and Surat school 26. There has been rigid selection of boys in all the schools except perhaps at Jambhul where it has been difficult to make up the number. In the case of Devihosur school, personal interview and preliminary test is *insisted on, a few months* prior to admission and preparatory class for a period varying from one to two months is arranged for such of the boys who fail in the test but who are very promising from the point of practical agriculture. Such boys receive a scholarship of Rs. 5 per month during their stay at the school for the preparatory class. The

system of giving scholarships to boys is being gradually introduced instead of free boarding as has hitherto been done in order to ensure earnestness for admission and *reduction* of *cost* of maintenance.

The *number of boys* in the *agricultural classes* attached to primary schools are as shown below :—

Gujarat Division 104 boys for 5 schools, Central Division 150 boys for 6 schools, Bombay Division 44 boys for 3 schools and Southern Division 67 boys for 4 schools. From the experience so far gained, it seems advisable not to open these classes in places where there are local English classes since these latter classes tend to decrease the number of boys for the agricultural classes. Further it seems desirable to open group schools and hold classses from 10 A.M. to 5 P.M. with recess in the middle, so as to suit the convenience of boys from the neighbouring villages and thus attract more of them for these classes. The utility of these classes will thus be indirectly enhanced without appreciable increase in the cost of running these schools.

Inspection of the work of the schools.—During the year under report Surat and Jambhul schools have made good progress as compared with their previous record. In the case of Godhra school, the progress was not upto the mark probably owing to the illness of the Headmaster during the working of the school. Devihosur school has kept upto its mark while Loni school has gone down, as the examiners remark that the calibre of 50 per cent. of the boys appear to be below the mark.

As regards agricultural classes, it may be said that many of the classes have made a good beginning. As there are many initial difficulties in the way of the agricultural teachers, some time must elapse before we can expect good progress. It is gratifying to note that a majority of the agricultural teachers have tried their best to keep up the enthusiasm of the students and enlist the sympathy of the local public.

General.—Though the agricultural classes are under the administrative control of the Educational Department, all spade work in connection with these schools is to be done by the Agricultural Department owing to the Agricultural nature of these schools and the necessity of frequent attention of the agricultural staff to ensure their success. This is further complicated by the fact that the agriculturists expect of these agricultural classes what they really ought to expect from the agricultural schools. Though it is not the object of the agricultural classes to actually train the boys for field work, the village public will have to be somehow satisfied by at least growing staple crops of the locality in the school garden according to the improved methods, else boys will not be sent for the course. This necessitates more knowledge on the part of the agricultural teachers and more attention for garden work which they cannot afford to give as they have to look to other subjects also. However small, a plot may be, some time and energy will have to be spent in arranging for tools, seeds, etc., required for sowing or watering or for other operation. As the time of the different operations on the school plot must of necessity coincide with that of the cultivator's operations it is not possible for the agricultural teacher to arrange for operations with

the aid of the cultivators before the latter finish their own work. As timely operations in agriculture are of utmost importance, it seems advisable to take an acre or two from cultivators on condition to spend Government money for improved seed, etc., and give them the produce if they do the operations needing the aid of bullocks. But in return for the money spent by Government, some small portion of the produce should be given to the students by the owner as an encouragement to boys working on the area. If this is brought into practice, there will be probably no difficulty to secure land for the school gardens and much of the time and energy of the agricultural teacher and Government money now spent on the plots can be utilised for other purposes in connection with agricultural classes for their further development. As every thing is in the initial stage and as the educational officers are not expected to realise these difficulties, the Inspector himself has to go into every detail and help the agricultural teacher in the work. It has therefore been necessary for the Inspector to arrange for close supervision and proper guidance. But as these classes are distributed all over the Presidency and as the number is increasing every year, it is not possible for one officer to devote sufficient attention to the training of boys and teachers in the agricultural schools, and at the same time supervise the work of the agricultural classes which latter absorb the major portion of the time of the Inspector, to the detriment of the more important duties in connection with the agricultural schools, for which the post was originally created. In order to cope with the work satisfactorily, more staff is necessary. The Senior Vernacular teachers working at the Agricultural Schools may be given as assistants to the Inspector, their pay being met from the Educational Department. For the present, two such assistants will suffice. If this is arranged, the genuine work of the agricultural schools can be properly developed and theory portion now taught can be brought into closer touch with practice by the introduction of seasonal time-table and devoting more attention to the practical working of students' societies, etc., formed for the purpose, and the training of students may thus be made more effective and of immediate use to their parents and the village public.

R. Y. HULKOTI,

Ag. Inspector of
Agricultural Schools.

APPENDIX S.

Annual Report on the work of Land Development for the year 1924-25 (year ending 30th June 1925).

The post of Land Development Officer was sanctioned under Government Resolution No. 6489, dated 30th May 1923 for a period of one year in the first instance. But it could not be filled up for want of a suitable man till September 1924. This new branch of the Agricultural Department was opened on the 22nd of September 1924 when Mr. N. C. Bapat the present incumbent took charge of the post. The annual report therefore gives the progress of work for a period of 9 months and 9 days only.

Actual survey work was commenced from the beginning of December when surveyors were appointed. For the purposes of this report the work of surveying, drawing, estimating, etc., extends over a period of 7 months.

The jurisdiction of the Land Development Officer extends over the whole Bombay Presidency excluding Sind and he is given two surveyors for survey and other works of investigation as well as the clerical work in office.

Schemes.—There were in all 52 schemes of land development placed before the Land Development Officer for investigation up to the end of June 1925. Their distribution by districts is—Poona 9, Sholapur 18, Satara 4, Nasik 1, Ahmednagar 3, Khandesh East 2, Khandesh West 1, Kolaba 2, Canara 1, Belgaum 2, Dharwar 5, Ratnagiri 1, Thana 2 and Broach 1.

The classification of these schemes from an engineering point of view is as under :—

(*a*) Diverting streams by putting dams across nalas or rivers for irrigation purposes .. Schemes—21

(*b*) Storing water by putting dams across nalas or rivers and distributing it by means of canals for irrigation .. .. .. Schemes— 6

(*c*) Storing water by means of dams and allowing it to percolate through the sub-soil, into the wells below .. .. .. Schemes— 2

(*d*) Field embankments (providing tals and waste weirs) .. .. .. Schemes—12

(*e*) Protecting land from the scouring action of the nala and making it culturable by means of silt deposit .. .. .. Scheme — 1

(*f*) Making use of the sub-soil water in flow-irrigation of lands falling below the subsoil water-level .. .. .. Scheme — 1

(*g*) Making use of the subsoil water in feeding the well under a pumping plant .. .. Scheme — 1

(*h*) Design for a well for mohot .. .. Scheme — 1

(*i*) Repairing an old tank and using it for irrigation purposes .. .. .. Scheme —1
(*j*) Irrigation by pumping .. .. Schemes—3
(*k*) Making use of the tail water of the Tata Hydro Electric Schemes, flowing through the Ulhas and Patalganga rivers, in developing lands .. Schemes—2
(*l*) Providing a protective bund to prevent damage of culturable land by sea .. Scheme —1

The distribution by districts of the schemes so classified is as given below :—

Class (*a*)	Poona 3, Ahmednagar 3, Khandesh East 1, Khandesh West 1, Kolaba 1, Canara 1, Belgaum 2, Ratnagiri 1, Sholapur 2, Dharwar 5, Thana 1	Total—21
„ (*b*)	Poona 4, Satara 1, Sholapur 1 ..	„ — 6
„ (*c*)	Nasik 1, Poona 1	„ — 2
„ (*d*)	Sholapur 12	„ —12
„ (*e*)	Sholapur 1	„ — 1
„ (*f*)	Satara 1	„ — 1
„ (*g*)	Satara 1	„ — 1
„ (*h*)	Sholapur 1	„ — 1
„ (*i*)	Sholapur 1	„ — 1
„ (*j*)	Poona 1, Khandesh East 1 and Satara 1.	„ — 3
„ (*k*)	Thana 1, Kolaba 1	„ — 2
„ (*l*)	Broach 1	„ — 1

Stages in investigation of Schemes.—The work of investigation has three stages. In the first stage the Land Development Officer visits the site to ascertain how far the scheme is feasible, the extent of work to be done, local conditions, etc. In the second stage survey with fly levels is made and the rough cost of the work as well as the probable area of land that will be developed are found out. And a rough picture of the whole state of things concerning the scheme is placed before the parties concerned. This helps them in arriving at a decision whether or not the scheme should be carried out. In the third stage, detailed survey, drawing and estimating works are carried out. All schemes excepting very small ones such as field embankments, have to go through all these three stages.

Progress of work.—Up to end of June 1925 eleven schemes were completely investigated and surveyed and the disposal of papers concerning the same is made. The area of lands expected to be developed by them is about 300 acres. Six schemes have gone through the 2nd stage. The area expected to be developed by them is about 6,000 acres. Six more schemes have partly gone through the second stage. They cover an area of about 3,000 acres (survey of these schemes is made and drawing and estimating work is being done in office). Three schemes, on visiting the site were found to be purely pumping schemes and hence they were handed over to the Agricultural Engineer who deals with such cases. In

addition to the work described above nine schemes have gone through the first stage only.

Besides the work of schemes, advice on engineering matters in agricultural work was given in three cases.

The work of land development cannot be measured by the number of schemes some of which are so big that each will take more than six months of the whole staff including the Land Development Officer to make detailed investigation, survey, drawings and estimating; and some are so small that the whole work of each can be done in a week.

The Land Development work is expected to give such results which will give direct benefit to the Agriculturists concerned. Any scheme successfully carried out will remain as a monument of the department in general and of this line in particular before the eyes of the present and the future generations. And it is hoped that this branch when fully developed, will stand in the front rank in all the branches through which the activities of the Department are felt.

We must work and patiently watch the results.

N. C. BAPAT,

6th July 1925. Land Development Officer, Poona.

APPENDIX T.

Summary of Work of Agricultural Propaganda in North & Middle Sind under the Assistant Registrar of Co-operative Societies in Sind.

I have the honour to submit a brief report on the progress of Agricultural Propaganda work in Sind for the 12 months ending 31st March 1925.

I remained in charge of the work for the entire period and the area of operations also continued to be the same 8 talukas as last year, *Viz.* :—

North Sind :—(1) Larkana, (2) Kambar, (3) Ghotki, (4) Sukkur.

Middle Sind :—(1) Hyderabad, (2) Halla, (3) Tando Allahyar, (4) Shahdadpur.

Propaganda Staff.

During the course of the year Mr. Abdul Rahman Agricultural Inspector Middle Sind was transferred to the Agricultural Department proper, and no substitute was appointed in his place. Mr. Mahomed Bux, a senior District Agricultural Overseer of Middle Sind, has been in charge of the work in addition to his own duties and the entire personnel for Agricultural Propaganda work is therefore as under :—

North Sind :—Mr. Lokram Agricultural Inspector ; and three District Agricultural Overseers.

Middle Sind :—Three District Agricultural Overseers only. One of them Mr. Mahomed Bux being in charge Agricultural Inspector.

Programme of work.

The following was the programme of work during the year :—

1. To popularize and distribute approved varieties of seed.
2. To popularize approved Agricultural Implements.
3. To propagate modern methods of farming.

During the year under report, however, there was one special facility, *viz.*, that much of the propaganda work was carried on through the agency of the Taluka Development Associations which have been organized in all the 8 talukas of the propaganda area.

Part I :—*Popularization and distribution of approved varieties of seed.*

(*a*) *Pusa 12.*

About 700 maunds of this variety of wheat had been purchased from the Jacobabad Farm and 1,570 maunds from the Sukkur District, and the entire quantity was distributed in the four talukas of the propaganda area in Upper Sind. About 400 maunds were also distributed in talukas Halla and Hyderabad of Middle Sind. In all, therefore, about 2,670 maunds of Pusa 12 were distributed in the propaganda area during the last Rabi season over and above the quantity sown by the zamindars out of their own stock of seed. The corresponding figure of distribution of Pusa 12 in 1923 is 1,000 maunds, *i.e.*, the quantity distributed has doubled itself in the course of one. year. There has likewise been a

commensurate increase in the voluntary sowings of Pusa 12 among the zamindars. Several zamindars having appreciated the value of this wheat grow it of their own accord and preserve their own stock of seed for further multiplication.

As regards the area grown under Pusa 12 the figures obtained show a very satisfactory progress. In 1923 the area was about 5,000 acres only, while in the last Rabi of 1924, the estimated area under Pusa 12 was nearly 14,000 acres in North Sind alone, as detailed below :—

1.	Taluka Ghotki	4,000	acres.
2.	Taluka Sukkur	2,500	,,
3.	Taluka Larkana	1,000	,,
4.	Non-intensive talukas in Upper Sind ..	6,500	,,
	Total ..	14,000	,,

The above particulars show that while the demand of Pusa 12 seed has more than doubled in one year the area sown under it has nearly trebbled.

The prolonged inundation of 1923 gave little chance of recuperative airation to the Rabi lands and the complete absence of rains during the last cold weather coupled with late frost from 15th to 25th February last, when the wheats were in the sheath or flowering stage damaged the crops to a great extent. The abundance of underground moisture however gave a fine start and growth to the crops and their immunity from rust or any other disease gave somewhat a fair yield and as the surviving crops fetched good prices in the market the agriculturists have no cause to complain about their wheat crop.

Position of Pusa 12 wheat in Sind.

The general opinion about Pusa 12 wheat is that it thrives very well in irrigated lands. In Kacha lands too it has given very good results where the underground moisture is ample. As for Bosi lands and those Kacha lands where there is not enough of sub-soil moisture, Pusa 12 cannot generally thrive so well. This fact was duly brought to the notice of the Deputy Director who is carrying on experiments to see if the complaint could be remedied.

While the success of Pusa 12 wheat from the point of yield under Bosi conditions is still a matter of controversy and experiment, its superiority in quality, tastefulness, high market value, early ripening and immunity from rust can never be gainsaid.

(*b*) *Cotton Seed Distribution.*

27 W. N. cotton seed not being available for distribution in the Kharif of 1924, I had to content myself with the Bhitshah variety only, about 2,000 maunds whereof had been purchased and distributed in the four talukas of the propaganda area of Middle Sind. The seed has given much appreciation to the zamindars. The ginneries pay a premimum of Re. 1 to Rs. 2 per maund of this variety. It has besides a ginning percentage of about 40 and yielding quantities higher than the ordinary Sindhi cotton. There is, besides, a saving in the seed rate also of about 20 lbs. per acre. During the present Kharif therefore the

demand for our seeds rose considerably and in all about 2,800 maunds both Bhitshah and 27 W. N. were distributed.

While inspecting cotton crops 'Bokhro' and 'wilt' disease were observed in several places and suggestions given to the zamindars how to avoid them. In many places the attacked plants were advised to be removed and burnt.

Part II :—Demonstration and sale of improved implements.

Demonstrations of Agricultural implements were, as usual, carried on with the Associations' pairs of bullocks at the fields of the zamindars and the popularity which our implements have acquired could be gauged from the following sales effected :—

Egyptian plough	.. 502	Archmedian Screw lifts	.. 25
Raja plough	.. 8	Monsoon ploughs	.. 13
Scrapers	.. 6	Meston ploughs	.. 36
Chaff Cutters	.. 3	Cambridge Rollers at	
Heavy Clod Crushers	.. 2	Rs. 150 each	.. 2

Plots were besides ploughed on rent at Rs. 2 per acre with the Egyptian plough, and Rs. 4 per acre with the Raja plough. In North Sind alone 400 acres were ploughed partly gratis for demonstration purposes and partly on rent. The amount of rent realized was Rs. 375 which was credited to the accounts of the Taluka Development Associations concerned. The system of thus ploughing up the zamindars' plots on the spot has the double advantage of giving them a first hand idea of the superiority of the Departmental ploughs on the one hand and showing them the advantage of Hot and Cold weather ploughing on the other.

In the course of their tour the Agricultural Inspectors and Overseers inspected the stock of ploughs and other implements supplied at various places and every attempt was made to execute repairs that were necessary and solve any doubts or difficulties that were experienced in the actual working of the implements.

Part III :—Popularization of modern methods of farming.

(a) Drill system.

Cotton cultivation is a speciality only of Middle Sind, and with a view to popularize the Drill System of cotton cultivation there the following number of plots were secured on the Zamindars' lands and cultivated on this system under the direct supervision of the Agricultural Inspector and Overseers :—

Taluka.	No. of plots drilled.	Acres.
Hyderabad	2	4
Shahdadpur	2	4
Tando Allahyar	4	8
Halla	5	7
Total ..	13	23

The plots were mostly intercultured twice with the Egyptian plough and this has saved the Agriculturists the time and labour usually spent on hoeing, and they therefore appreciated it very much. Some of the most advanced zamindars in cotton cultivation have furnished very good certificates about the superiority of the Drill system and these are available on our record. Apart from the saving effected in time and labour ordinarily spent on hoeing, it has also been found that the growth of the drilled cotton is much quicker and vigorous than that of cotton sown under ordinary conditions.

(*b*) *Practical demonstrations in rice plots.*

With a view to bring home to the Agriculturists the superiority of improved methods of farming in Rice cultivation 60 plots of flow land were secured from the zamindars in Larkana and Kambar talukas and arrangements made for their cultivation to domonstrate the following points of advantage :—

1. Economy in seed rate.
2. Early transplantation.
3. Bengal variety (dadkani) *versus* local variety.
4. Dry ploughing *versus* " Daph ".

Points 1 and 2.—Good many zamindars in Larkana and Kambar talukas have adopted these improvements (1 and 2) wholesale. Certificates of some of the most prominent zamindars have been obtained which eloquently speak about these improvements. With regard to the economy in seed rate, the fact has been established that while the usual seed rate of rice is one maund per acre, the areas grown with half that rate, *i.e.*, ½ maund per acre have given equally good results. As for earlier transplantation of seedlings also, it has been found that if seedlings are sown before the innundation on the existing wells or on the banks of the main canals, at least 25 per cent. of the total area could be sown about 25 days earlier than usual. This 25 days earlier transplanting has been actually found to have remarkable effect on the yield to the extent of almost doubling it up.

Point 3—Dadkani variety of Bengal rice.—This variety of rice has continued to be appreciated in the low lands in particular. Grown under right conditions, it gives better yield and better price than the ordinary rough varieties of " Thorh " and " Larhi ".

Point 4. —As regards this point, *viz.*, Dry ploughing *versus* ' Daph ' the usual practice in Larkana and Kambar Talukas is to irrigate the rice land and then plough it. This process is called ' Daph ', which is indeed a primitive method. Rice lands ploughed up in the dry condition a few months before sowing has been found to give better yield. Some plots were actually obtained from zamindars and ploughed up in dry condition and the results having been very satisfactory good many zamindars

are now actually insisting upon their Haris to adopt the system on pain of dismissal.

Part IV. Taluka Development Associations.

The Taluka Associations organized in the 8 talukas of the propaganda area did much useful work during the year and have proved themselves very useful organizations in carrying through the programme of intensive propaganda work.

The number of subscribers of the Associations has more than doubled during the year, having reached 2,492 as against 1,128 in the preceding year. Their total contributions during the year aggregated Rs. 5,163 and the amount was supplemented by a Government subsidy of Rs. 5,150 which though sanctioned during the year could not actually be disbursed before the 1st of June last.

The Associations are managed by select and competent bodies of leading persons of the talukas concerned who take great interest in them. They often go out in the villages to look into the condition of the people and the taluka. All the Associations maintain a well paid staff of their own consisting of a Supervisor and a Kamgar, who do regular tour, visiting Co-operative Societies and carrying on Agricultural Propaganda among them.

SEED DISTRIBUTION AND SUPPLY BUSINESS BY THE ASSOCIATIONS.

Three out of the four Associations of Upper Sind, *viz.*, Ghotki, Sukkur and Larkana distributed about 2,270 maunds of Pusa 12 during the last Rabi. Kambar taluka being purely rice growing, no Pusa 12 was distributed in it. The four talukas of Middle Sind grow only cotton. About 2,000 maunds of Bhitshah cotton seed were distributed therein as there was no 27 W. N. seed available last year.

The Hyderabad and Tando Allahyar Associations have gone a step further and supplied Agricultural requisites to members to the extent of Rs. 20,000. The experiment having been well appreciated by the people, steps are being taken to organize Supply Societies.

Implements.

Each Association maintains a Depot of implements wherefrom implements are issued both on hire and sale. Rent realized during the year was Rs. 350 and the implements sold are already given in the report.

Seed Societies.

In order to relieve the Taluka Development Associations of their seed business, Seed Societies have been organized in six out of the eight talukas

of the propaganda area, *viz.*, Sukkur, Ghotki, Larkana and Kambar in Upper Sind and Hyderabad and Tando Allahyar in Middle Sind. They are doing well and the last year almost whole of the seed distribution business was carried on through the Seed Societies.

AZIMKHAN INAYATALIḲHAN,
Assistant Registrar, Co-operative Societies, Sind.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

List of Agricultural Bulletins published by the Department of Agriculture and kept for Sale at the Government Book Depot, Bombay.

No.	Year.	*Subject.*	Price. Rs. a. p.
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33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0 4 0
,,	,,	,, ,, ,, (Kanarese)	0 4 0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona	0 4 0
35	1909	Kalar in Sind, by G. S. Henderson, Deputy Director of Agriculture, Sind	0 4 0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist	0 14 0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0 4 0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona	0 5 0
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48	1911	Poona Furnace	0 7 0
,,	,,	,, (Marathi)	0 6 0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0 5 0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0 3 0
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52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0 8 0
53	1912	A Method of improving the Quality of Cotton Seed	0 7 0
55	1913	An Examination of the Seed-Supply of the Poona District	0 3 0
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No.	Year.	*Subject.*	Price. Rs. a. p.
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90	1918	Work on the Manjri Farm for the years 1915-18	0 7 3
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103	1920	The Book of the Mango	3 5 0
		,, ,, ,, (Marathi)	
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107	1921	Gonag—a weed in drilled paddy	0 5 0
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		,, ,, ,, ,, (Marathi).. ..	
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112	1923	Improvement of Grazing Areas in the Bombay Presidency ..	0 11 6
113	1923	Year Book of the Agricultural Department in Sind Division ..	
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115	1924	Shevri as a Fooder Crop	0 3 0
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*In the Press.